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S. HRG. 108–347

CLEAR SKIES ACT OF 2003

HEARINGS

BEFORE THE

SUBCOMMITTEE ON CLEAN AIR, CLIMATE CHANGE, AND NUCLEAR SAFETY

OF THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS UNITED STATES SENATE

ONE HUNDRED EIGHTH CONGRESS

FIRST SESSION

ON

S. 485

A BILL TO AMEND THE CLEAR AIR ACT TO REDUCE AIR POLLUTION THROUGH EXPANSION OF CAP AND TRADE PROGRAMS, TO PROVIDE ALTERNATIVE REGULATORY CLASSIFICATION FOR UNITS SUBJECT TO THE CAP AND TRADE PROGRAM, AND FOR OTHER PURPOSES

APRIL 8, 2003
MAY 8, 2003
JUNE 5, 2003

Printed for the use of the Committee on Environment and Public Works



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FIRST SESSION

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THE CLEAR SKIES ACT OF 2003

TUESDAY, APRIL 8, 2003

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON CLEAN AIR, CLIMATE CHANGE AND NUCLEAR SAFETY,
Washington, DC.

The committee met, pursuant to notice, at 2:12 p.m. in room 406, Senate Dirksen Building, the Hon. George V. Voinovich [chairman of the committee] presiding.

Present: Senators Jeffords, Inhofe, Thomas, Cornyn, and Carper.

Senator VOINOVICH. The hearing will come to order.

I am very pleased that the chairman and ranking member of the full committee are here today. Senator Inhofe, who is chairman of the committee, has another meeting he has to attend. He asked if we extend the courtesy of doing his opening statement.

OPENING STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE STATE OF OKLAHOMA

Senator Inhofe, I really thank you for being here. We look forward to your opening statement.

Senator INHOFE. Thank you, Senator Voinovich. There is an Armed Services meeting at the same time. There is a problem we have been trying to resolve, unsuccessfully.

Thank you, Madame Administrator, for coming before us to testify on the Clear Skies Act. I know that the signal that is sent by your presence here shows how significant this is to the Administration.

I would like to begin by complementing the Administration for taking the Clean Air Act into the 21st Century. This legislation cuts emissions of sulfur dioxide, nitrous oxide, and mercury by 70 percent, which is the largest reduction ever called for by any American President.

As you know, the Clean Air Act has resulted in tremendous gains in improving the air quality in our Nation in the last 30 years. Lead, which was commonplace in gasoline, is virtually gone from our air sheds. That has led to improvements in control technologies from the auto industry, power plants, and other industrial sectors.

As a result, U.S. manmade emissions have declined dramatically for all six criteria pollutants. They declined by 29 percent. That is at a time when population has increased by 38 percent, the GDP has increased by 160 percent and the vehicle miles traveled 143 percent. It is a success story.

The power industry has been a vital part of that success. Since 1970, emission rates at coal-fired power plants for sulfur dioxide and nitrogenous oxides have been cut by more than half. Unfortunately, each additional turn of emissions reduction in our Nation's States to reduce comes at an increasingly expensive price tag.

The current Act is plagued by bureaucratic and sometimes contradictory programs. Every new significant regulation is greeted by endless rounds of litigation that do more for trial lawyers than they do to clean up the air. A prime example of that is the 1997 PM/ozone rule that still has not been implemented because of the years of litigation.

Generators face an uncertain future as to what costs will be imposed on them. Without certainty, generators will hesitate to invest in significant capital necessary to build a new base-load coal plant to meet our Nation's growing demand.

Two years ago, natural gas prices spiked and the Nation witnessed a crisis that took place in California. They spiked again this February going as high as $19.50. We should not strain natural gas supplies beyond its ability to continue to service residential consumers and industrial users.

Preserving our diverse fuel mix also promotes national security. More than half of the Nation's electricity currently from coal. Our Nation has been called the Saudi Arabia of coal. As this chart shows, 85 percent of the ultimately recoverable fuel reserves on a Btu basis are coal. That's simply too important of a resource to push aside.

I was talking to Chairman McCullough of TVA right before this meeting, and we both agree, we have to have all forms of energy.

The only issue I remain concerned about is mercury. When the President's announced his Clean Skies initiative, we were told that the Phase 1 cap of 26 tons would be based on the benefit of controls installed to meet the sulfur dioxide and nitrogen oxide caps. It now appears that the 26 tons has been redefined as a cost-effective level. My constituents tell me that 26 tons is an unrealistic target and will cause fuel-switching from coal to natural gas, which I find very troubling. I believe we should return to basing the mercury level on actual coal benefits.

I am pleased, however, that the bill does not attempt to regulate carbon dioxide, which is not a pollutant under the Clean Air Act. As you know, I am an avid proponent of taking costs into consideration. To the extent that there is any consensus in the climate change to date, it is that even the draconian Kyoto Protocol would have no measurable effect on global temperatures. In other words, regulating carbon dioxide would bring no measurable benefits, at extreme costs.

The President's Clear Skies approach is the sensible approach and will result in the most significant reforms. By putting in place a cap and trade program based on the Acid Rain Program—the most successful and efficient program in the Clean Air Act Amendments of 1990—power plant operators will have the flexibility to choose which plants should have which control technologies, so that the system gets the biggest bang for the environmental buck.

I look forward to your hearing today, Mr. Chairman.

[The prepared statement of Senator Inhofe follows:]

STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE STATE OF OKLAHOMA

Thank you Madam Administrator for coming before us to testify on the President's Clear Skies legislation. I appreciate your presence here today and the signal it sends as to how important this legislation is to the Administration.

I would like to begin by complimenting the Administration for taking the Clean Air Act into the 21st century. This legislation cuts emissions of sulfur dioxide, nitrogen oxides, and mercury by 70 percent the biggest reductions ever called for by an American President.

As you know, the Clean Air Act has resulted in tremendous gains in improving the air quality in our nation over the last 30 years. Lead, which was commonplace in gasoline, is virtually gone from our airsheds. The Act has led to improvements in control technologies from the auto industry, power plants, and other industrial sectors. As a result, U.S. man-made emissions have declined dramatically for all six criteria pollutants by 29 percent since 1970.

The power industry has been a vital part of that success story. Since 1970, emission rates at coal-fired power plants for sulfur dioxide and nitrogen oxides have been cut by more than half.

Unfortunately, each additional ton of emissions reduction that our nation seeks to reduce comes at an increasingly expensive price tag. The current Act is plagued by bureaucratic and sometimes contradictory programs, and every new significant regulation is greeted by endless rounds of litigation that do more for trial lawyers than they do to clean up the air. A prime example of that is the 1997 PM/ozone rule that has still not been implemented because of years of litigation.

Generators face an uncertain future as to what costs will be imposed on them. Without certainty, generators will hesitate to invest the significant capital necessary to build a new base-load coal plant to meet our nation's growing demand into the future. Two years ago, natural gas prices spiked and the Nation witnessed the California energy crisis. Prices spiked again this February, going as high as $19.50. We should not strain natural gas supplies beyond its ability to continue to service residential consumers and industrial users. Preserving our diverse fuel mix also promotes national security. More than half of the nation's electricity currently comes from coal. Our country has been called the "Saudi Arabia of coal." As this chart shows, 85 percent of the ultimately recoverable fuel reserves on a Btu basis are coal. That is simply too important a resource to push aside.

One issue I remain concerned about is mercury. When the President announced his Clear Skies Initiative, we were told that the phase 1 cap of 26 tons would be based on the co-benefit of controls installed to meet the sulfur dioxide and nitrogen oxides caps. Now it appears the 26 tons has been redefined as a cost-effective level. My constituents tell me that 26 tons is an unrealistic target and will cause fuel switching from coal to natural gas, which I find very troubling. I believe we should return to basing the mercury level on actual co-benefits.

I am pleased, however, that the bill does not attempt to regulate carbon dioxide, which is not a pollutant under the Clean Air Act. As you know, I am an avid proponent of taking costs into consideration. To the extent that there is any consensus in the climate change debate, it is that even the draconian Kyoto protocol would have no measurable effect on global temperatures. In other words, regulating carbon dioxide would bring no measurable benefit at extreme costs.

The President's Clear Skies approach is the sensible approach, and will result in the most significant reforms. By putting in place a cap and trade program based on the Acid Rain program the most successful and efficient program in the Clean Air Act Amendments of 1990 power plant operators will have the flexibility to choose which plants should have which control technologies so that the system gets the biggest bang for the environmental buck.

I look forward to hearing from you on this aggressive initiative for reducing air emissions.

OPENING STATEMENT OF HON. GEORGE V. VOINOVICH, U.S. SENATOR FROM THE STATE OF OHIO

Senator VOINOVICH. Thank you, Mr. Chairman.

I am probably going to have a little longer statement than I ordinarily would, but this is an initial hearing on something very, very important to the future of our country and to our economy and to the environment. It is going to be the first that we intend to have during this session of Congress on the Clean Air Act. It is an issue

that is critically important to me and very important to my home State of Ohio, which is a major manufacturing State. For several years now, this committee has been grappling with the complex issue of how to clean our air by reducing emissions without putting our economy in a stranglehold. Today, we are here to discuss the Clear Skies Act, S. 485, which is a proposal sent to us by President Bush to reduce power plant emissions and protect our economy, and improve our environment and public health.

As we hear testimony on Clear Skies from our three distinguished panels, I think we need to keep in mind the important context in which we consider this legislation. I think so often here in Congress we get so wrapped up in the weeds and the grass that we don't see the big picture. It is no secret that our economy is struggling. One of the key reasons our economy is sputtering is that we don't have an energy policy. As I have often stated, we sorely need to develop a long-overdue energy policy for our Nation. As a member of the Energy Task Force, I will do everything I can to work for passage of an energy bill that harmonizes the needs of our economy and our environment this year. These are not competing needs; a sustainable environment is critical to a strong economy, and a sustainable economy is critical to providing the funding necessary to improve the environment.

We need a policy that broadens our base of energy resources to create stability, guarantee reasonable prices, and protect America's security. It has to be a policy that will keep energy affordable. Finally, it has to be a policy that won't cripple the engines of commerce that fund the research that will yield future environmental protection technologies.

Right now, about 86 percent of the electricity generated in my State comes from coal-fired facilities. The chairman of the committee has made it clear how much energy is produced in this country from coal, about 50 percent. For generations, the use of coal for electricity not only provided affordable and reliable electricity for Ohio manufacturers, it helped to keep the costs of natural gas down, as well. This combination of affordable electricity and low-cost natural gas is absolutely critical to the health of Ohio's manufacturing base and, just as important, our Nation's manufacturing base.

The Clean Air Act, enacted in 1970 to protect and enhance the quality of the Nation's air resources, has been extremely successful in reducing emissions of pollutants. As these charts show, since 1970, emissions of all criteria pollutants have been reduced by 29 percent, despite the fact that energy use is up 42 percent, electricity use has grown 159 percent, and the Gross Domestic Product has grown 160 percent. However, the current approach to regulation utilized by the EPA is plagued with burdensome and overlapping regulations that are subject to costly and time-consuming litigation and have become unnecessarily costly.

There are now more than a dozen separate regulations on the books for sulfur dioxide and nitrogen oxide alone, with additional regulations around the corner. As this chart illustrates, the regulatory process at EPA is long, complex and costly. Further litigation over several of these regulations has already delayed their implementation, forestalling the air quality benefits that they were

designed to achieve. This patchwork of existing and soon-to-be-implemented regulations, coupled with the delays bred by continuous litigation over them—on both sides, for that matter—has created enormous uncertainty for utilities, co-ops, and municipal generators. This uncertainty has curtailed investments in technology that would reduce emissions at existing plants, prevented numerous new facilities from coming on line, and caused several utilities to try to phaseout coal-based generation altogether by fuel switching.

Fuel switching—changing from coal-based generation to natural gas-based generation—I believe is a tremendous threat to the economy of not just Ohio, but to the Nation as well. There are currently over 5,000 power plants in the United States that generate over 850,000 megawatt hours of electricity annually. In 2002, 19 percent of our electricity was generated by natural gas, as opposed to 50 percent generated by coal. Reliance on natural gas for even this much generation has put a tremendous strain on natural gas supplies and pushed prices on available gas to record highs.

The President's National Energy Policy Task Force projected that over 1,300 new power plants will need to be built to satisfy America's energy needs over the next 20 years. Because of the emissions limits and regulatory uncertainty triggered by the Clean Air Act, the Department of Energy currently predicts that over 90 percent of these new plants will be powered by natural gas. Further, analysis by EIA and the EPA shows that a large percentage of coal-fired plants are likely to be replaced by natural gas-fired plants in the near future.

We do not have enough natural gas to power all of these new facilities, and we do not have the capability to increase our supply to meet this demand. Unless Congress develops a plan to deal with this situation, we are looking at major natural gas shortages, spikes in natural gas prices, and significant spikes in electricity prices.

Shortages in natural gas supply—and the resultant increase in natural gas prices—do not just affect utilities. Many other industries rely on natural gas, and I think a lot of Americans are not aware of this, such as the farming community, the steel and metal industries as is pointed out on that charge, chemical and polymer manufacturers. My chemical and polymer people in the State of Ohio are in deep financial trouble today because of the high cost of natural gas. They are completing with people in the global marketplace that don't have those large costs. It also impacts on the food processing industry.

It is not difficult to understand why a major shortage of natural gas, coupled with skyrocketing prices for natural gas and electricity, will ensure that many of our companies will no longer be able to remain competitive in the global marketplace. I recently met with manufacturers in my hometown of Cleveland, about 50 of them, and I was shocked when two of them told me that they were seriously considering moving their operations overseas because of high energy prices.

Although high electricity prices would severely affect businesses and their ability to compete in the global marketplace, it will have an even more profound impact on low-income families and the elderly, as some of you on this committee have seen before. High en-

ergy costs impact most on those that are least able to pay for it. This chart is based on the Department of Energy statistics, and shows that low-income families pay a disproportionate share of their income on energy, which prevents that money from being used for other necessities. The Centers for Disease Control states that more of our elderly and children died from heat exposure between 1979 and 1999 than from all other natural disasters combined.

For several years now, I have been trying to work on a bipartisan basis to head off this oncoming train wreck. During the last Congress we held several hearings on the need to harmonize our environmental and energy policies that highlighted the need to promote energy development and environmental protection. I worked with Senators Bingaman and Murkowski on comprehensive energy legislation, and with Senator Jeffords and Senator Carper to try to find a bipartisan Clean Air reform last year. Unfortunately, we were not able to enact comprehensive energy legislation on a bipartisan basis, and we are no closer today to solving the problems than we were a year ago, 2 years ago, or 3 years ago.

In order to defuse the time bomb of skyrocketing natural gas and electricity prices that is sitting in our laps, Congress must enact a comprehensive energy policy that will increase our development of natural gas supplies and ensure that we have a diverse fuel mix for electricity generation that includes nuclear, renewables, natural gas, and coal. To get there, the Senate must pass both comprehensive energy legislation and also deal with this legislation that is before us today.

In my opinion, the Clear Skies that you are here to testify about will improve the Clean Air Act by providing greater certainty that emissions are reduced, while providing a stable regulatory environment that allows utilities to install necessary pollution controls without the fear that those controls will be obsolete before they are paid for. It will result in cleaner air, less regulation and litigation, and lower energy costs to manufacturers and American consumers. Simply put, this legislation can provide tremendous benefits to the environment, and is crucial to the long-term survival of our economy and our manufacturing base.

I am not going to get into the details of the legislation in terms of the tonnage that is going to be reduced, because I am sure that you will mention that in your testimony. But I will mention that the emissions cap and trading program in Clear Skies is based on the proven success of the Acid Rain Program contained in Title IV of the Clean Air Act, which to date has been the most effective clean air program, having reduced SO_2 emissions by 37 percent through 2000, while saving hundreds of millions of dollars in compliance costs.

The Clear Skies Program will provide power plants with the flexibility to choose among various options for reducing emissions that best fits their specific circumstances, while saving over $1 billion in compliance costs.

Clear Skies also contains several provisions that reform existing Clean Air Act programs to streamline the regulatory process and help reduce the existing patchwork of regulations and rules.

The flexibility of Clear Skies' market-based cap and trade program and the certainty of its emissions reduction targets, combined with these reforms, will ensure that real reductions called for in this bill can be achieved without forcing utilities to fuel-switch and without forcing electricity and natural gas prices through the roof. Perhaps most importantly, Clear Skies will help ensure that the least of our brothers and sisters will not be forced to forego heating their homes, and that our companies will not be forced to move overseas to remain competitive in the global marketplace due to high electricity and natural gas prices.

As I mentioned at the beginning of my remarks—and I apologize for the length of them—this is the first of several hearings that we intend to hold in this subcommittee on Clear Skies. It is my intention to mark up Clear Skies at the subcommittee level as quickly as possible, and I will push hard to have the full committee report a bill to the floor and have the Senate pass it during this Congress.

I want to thank our witnesses this afternoon. Administrator Whitman, I appreciate your coming to present the President's proposal to the subcommittee.

It is also a pleasure to have the Administrator testify before us today, especially on a topic as important as this one. I look forward to your testimony. I look forward to the testimony of the other witnesses that will be before us today.

Senator Jeffords is the ranking member of the Environment and Public Works Committee.

[The prepared statement of Senator Voinovich follows:]

STATEMENT OF HON. GEORGE V. VOINOVICH, U.S. SENATOR FROM THE STATE OF OHIO

This hearing is the first of several that we intend to have during this Congress on reforms to the Clean Air Act. This is an issue that is critically important to me and to my home State of Ohio, a major manufacturing State. For several years now, this committee has been grappling with the complex issue of how to clean our air by reducing emissions without putting our economy in a stranglehold. Today, we are here to discuss the Clear Skies Act (S. 485), which is a proposal sent to us by President Bush to reduce power plant emissions and protect our economy.

As we hear testimony on Clear Skies from our three distinguished panels today, I think we need to keep in mind the important context in which we consider this legislation. It is no secret that our economy is struggling. One of the key reasons our economy is sputtering is that we don't have an energy policy. As I have often stated, we sorely need to develop a long overdue energy policy for our Nation. As a member of the Energy Task Force, I will do everything I can to work for passage of an energy bill that harmonizes the needs of our economy and our environment this year. These are not competing needs. A sustainable environment is critical to a strong economy, and a sustainable economy is critical to providing the funding necessary to improve our environment.

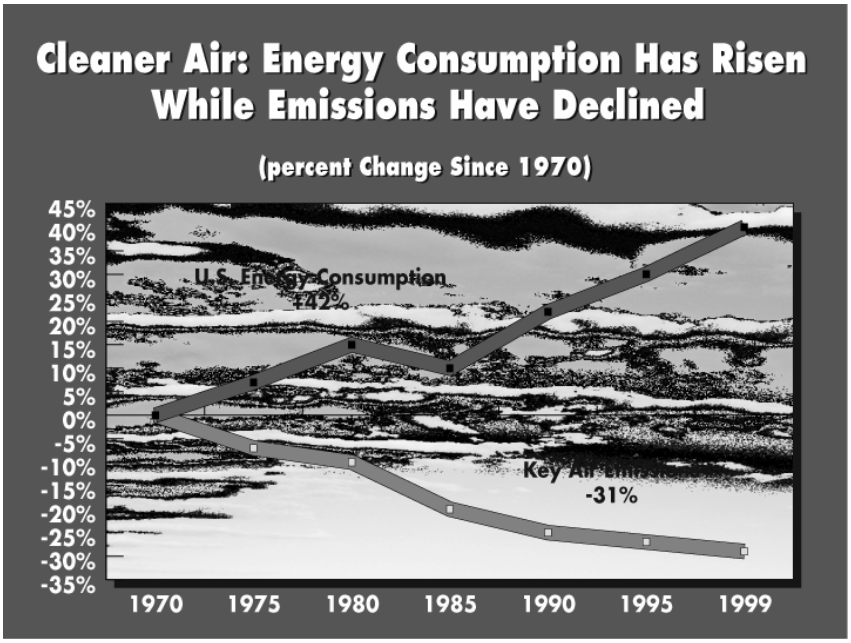
We need a policy that broadens our base of energy resources to create stability, guarantee reasonable prices, and protect America's security. It has to be a policy that will keep energy affordable. Finally, it has to be a policy that won't cripple the engines of commerce that fund the research that will yield future environmental protection technologies.

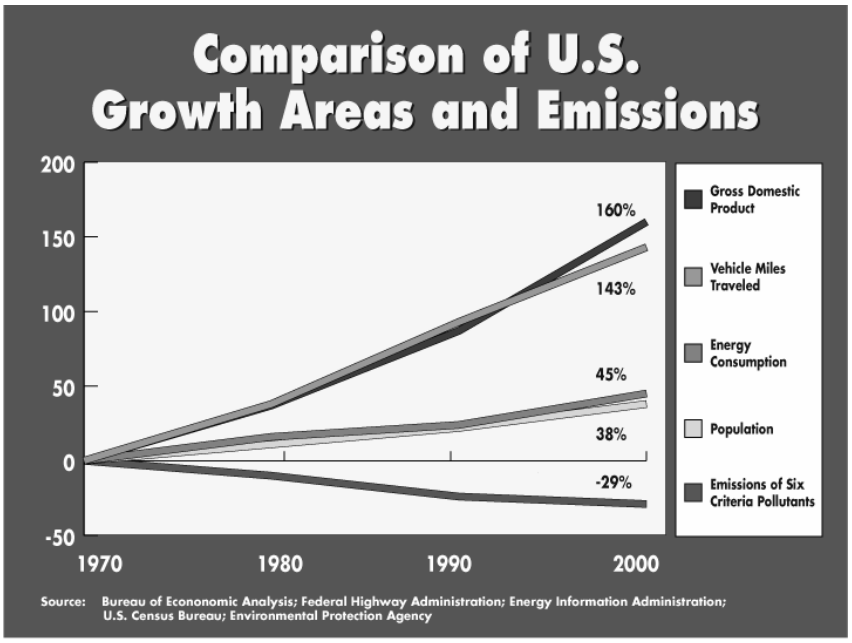
Right now, about 86 percent of the electricity generated in Ohio comes from coal-fired facilities. For generations, the use of coal for electricity generation has not only provided affordable and reliable electricity for Ohio manufacturers, it has helped to keep the costs of natural gas down as well. This combination of affordable electricity and low-cost natural gas is absolutely critical to the health of Ohio's manufacturing base, and our Nation's manufacturing base.

The absence of a comprehensive national policy that harmonizes energy production and environmental protection has led to an unfortunate (and predictable) situation in which the rules and regulations intended to protect our environment are

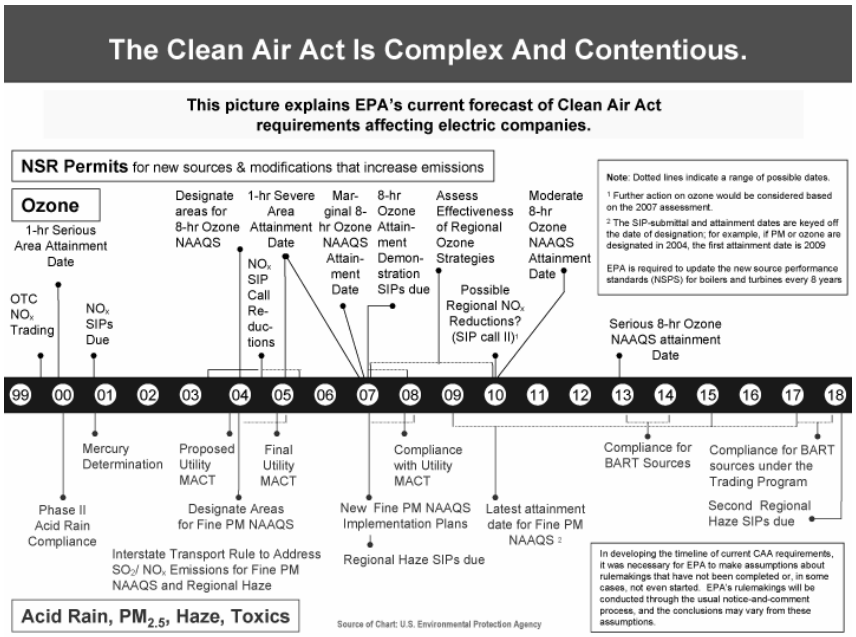
threatening to undermine our economy while failing to achieve significant environmental goals.

The Clean Air Act, enacted in 1970 to protect and enhance the quality of the nation's air resources, has been extremely successful in reducing emissions of pollutants. As these charts show—Since 1970, emissions of all criteria pollutants have been reduced by 29 percent despite the fact that energy use is up 42 percent *[CHART 1]*, electricity use has grown 159 percent and Gross Domestic Product has grown 158 percent *[CHART 2]*. However, the current approach to regulation utilized by the EPA is plagued with burdensome and overlapping regulations that are subject to costly and time-consuming litigation and have become unnecessarily costly.

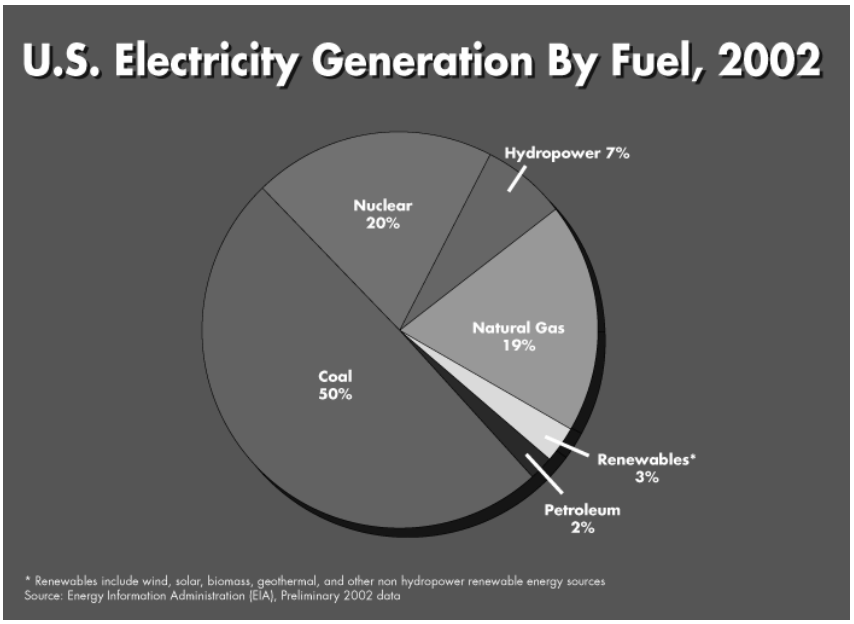




There are now more than a dozen separate regulations on the books for sulfur dioxide (SO_2) and nitrogen oxide (NOx) alone with additional regulations around the corner. As this chart illustrates, the regulatory process at EPA is long, complex and costly *[CHART 3]*. Further, litigation over several of these regulations has already delayed their implementation, forestalling the air quality benefits that they were designed to achieve. This patchwork of existing and soon-to-be-implemented regulations, coupled with the delays bred by continuous litigation over them, has created enormous uncertainty for utilities, co-ops, and municipal generators. This uncertainty has curtailed investments in technology that would reduce emissions at existing plants, prevented numerous new facilities from coming online, and caused several utilities to try to phase-out coal-based generation altogether by fuel switching.

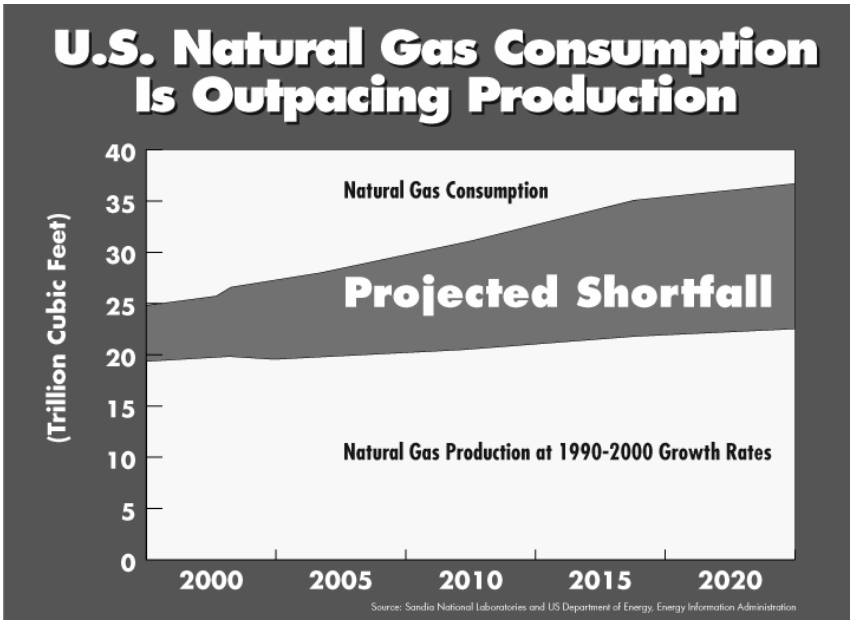


Fuel switching changing from coal-based generation to natural gas-based generation is a tremendous threat to the economy of not just Ohio, but to the Nation as well. There are currently over 5,000 power plants in the United States that generate over 850,000 megawatt hours of electricity annually. In 2002, 19 percent of our electricity was generated by natural gas as opposed to 50 percent generated by coal *[CHART 4]*. Reliance on natural gas for even this much generation has put a tremendous strain on natural gas supplies and pushed prices on available gas to record high prices.

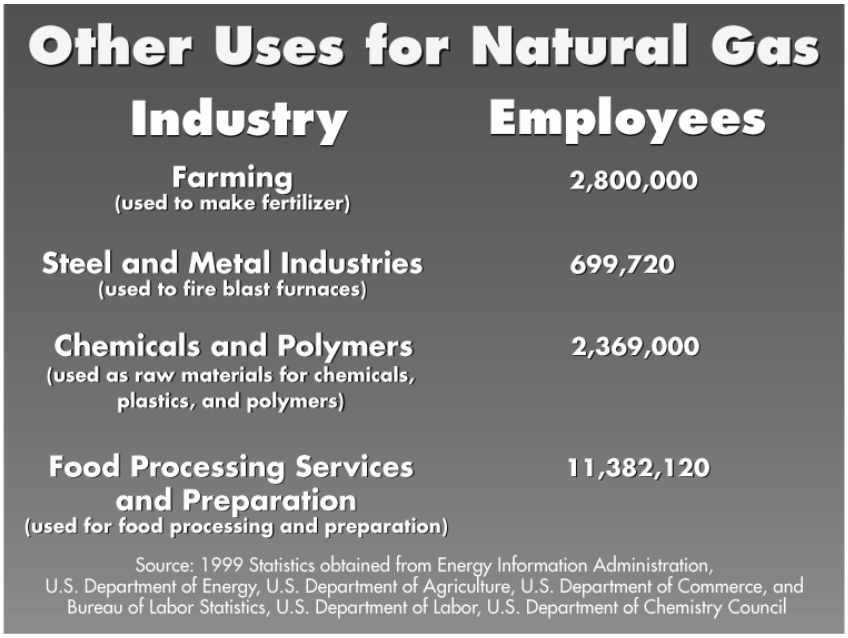


The President's National Energy Policy Task Force projected that over 1,300 new power plants will need to be built to satisfy America's energy needs over the next 20 years. Because of the emissions limits and regulatory uncertainty triggered by the Clean Air Act, the Department of Energy currently predicts that over 90 percent of these new plants will be powered by natural gas. Further, analysis by EIA and the EPA shows that a large percentage of coal-fired plants are likely to be replaced by natural gas-fired plants in the near future.

We do not have enough natural gas to power all of these new facilities, and we do not have the capability to increase our supply to meet this demand *[CHART 5]*. Unless Congress develops a plan to deal with this situation, we are looking at major natural gas shortages, spikes in natural gas prices, and spikes in electricity prices.



Shortages in natural gas supply and the resultant increase in natural gas prices do not just affect utilities. Many other industries rely on natural gas such as the Farming Community, the Steel and Metal Industries, Chemical and Polymers Manufacturers and Food Processing Industry *[CHART 6]*. It is not difficult to understand why a major shortage of natural gas coupled with skyrocketing prices for natural gas and electricity will ensure that many of our companies will no longer be able to remain competitive in the global marketplace. I recently met with a group of Manufacturers in my hometown of Cleveland. I was shocked when two of them told me that they were seriously considering moving their operations overseas because of high energy prices.



Although high electricity prices would severely affect businesses and their ability to compete in the global marketplace, it will have an even more profound impact on low-income families and the elderly. Everyday, many Americans are forced to make choices between paying for electricity or food and other essentials such as medicine when energy prices are high. This chart, based on Department of Energy statistics shows that low-income families pay a disproportionate share of their income on energy which prevents that money from being used for other necessities *[CHART 7]*. The Center for Disease Control (CDC) states that more of our elderly and children die from heat exposure (8,015 between 1979 and 1999) than from all other natural disasters combined. The CDC also claims that air conditioning is the No. 1 preventative factor against heat exposure.



For several years now, I have been trying to work on a bipartisan basis to head off this oncoming train wreck. During the last Congress, I held several hearings on the need to harmonize our environmental and energy policies that highlighted the need to promote energy development and environmental protection. I worked with Senators Bingaman and (Frank) Murkowski on comprehensive energy legislation, and with Senator Jeffords and Senator Carper to try to find a bipartisan compromise on Clean Air Act reform. Unfortunately, we were not able to enact comprehensive energy legislation or reach a bipartisan Clean Air agreement, and we are no closer to solving these very real problems.

In order to defuse the time bomb of skyrocketing natural gas and electricity prices that is sitting in our lap, Congress must enact a comprehensive energy policy that will increase our development of natural gas supplies and ensure that we have a diverse fuel mix for electricity generation that includes nuclear, renewables, natural gas and coal. To get there, the Senate must pass both comprehensive energy legislation that promotes domestic natural gas development and multi-pollutant legislation that will streamline the regulatory process, maintain the diversity of our fuel mix and achieve greater emissions cuts to protect our environment.

While the task of passing comprehensive energy legislation is underway over in the Energy Committee and I commend Chairman Domenci for the work he doing on the bill—the task of passing multi-pollutant legislation falls on us here in this committee.

Earlier this year, in order to move multi-pollutant legislation that will protect both our environment and our economy through the committee, Chairman Inhofe and I introduced the Clear Skies Act (S. 485) by request. This bill—which calls for 70 percent reductions in SO_2, NOx, and Mercury—will deliver far-reaching benefits and maintain energy diversity by expanding and strengthening a proven mandatory, market-based approach to reducing emissions.

The Clear Skies Act will improve the Clean Air Act by providing greater certainty that emissions are reduced while providing a stable regulatory environment that allows utilities to install necessary pollution controls without the fear that those controls will be obsolete before they are paid-for. It will result in cleaner air, less regulation and litigation, and lower energy costs to manufacturers and American consumers. Simply put, this legislation will provide tremendous benefits to the environment and is crucial to the long-term survival of our economy and our manufacturing base.

Specifically, the Clear Skies Act would establish federally enforceable emissions limits for SO_2, NOx and Mercury. For SO_2, Clear Skies sets a Phase I cap of 4.5

million tons in 2010 and a Phase II cap of 3 million tons in 2018 down from 11.2 million tons in 2000. For NOx, Clear Skies sets a Phase I cap of 2.1 million tons in 2008 and a Phase II cap of 1.7 million tons in 2018 down from 5.1 million tons in 2000. For Mercury, Clear Skies sets a Phase I cap of 26 tons in 2010 and Phase II cap of 15 tons in 2018 down from 48 tons in 2000. These reductions are a not only robust a 73 percent reduction for SO_2, a 67 percent reduction for NOx, and a 69 percent reduction for Mercury, they would constitute the largest Clean Air Act emission reduction targets ever requested by a President.

The emissions cap and trading program in Clear Skies is based on the proven success of the acid rain program contained in Title IV of the Clean Air Act—which to date has been the most effective clean air program, having reduced SO_2 emissions by 37 percent through 2000 while saving hundreds of millions of dollars in compliance costs. The Clear Skies program will provide power plants with the flexibility to choose among various options for reducing emissions that best fits their specific circumstances while saving over $1 billion annually in compliance costs.

Clear Skies also contains several provisions that reform existing Clean Air Act programs to streamline the regulatory process and help reduce the existing patchwork of regulations and rules.

The flexibility of the Clear Skies' market-based cap and trade program and the certainty of its emissions reduction targets—combined with these reforms—will ensure that the real reductions called for in this bill can be achieved without forcing utilities to fuel switch and without forcing electricity and natural gas prices through the roof. Perhaps most importantly, Clear Skies will help ensure that the least of our brothers and sisters will not be forced to forego heating their homes—and that our companies will not be forced to move overseas to remain competitive in the global market due to sky-high electricity and natural gas prices.

As I mentioned at the beginning of my remarks, this is the first of several hearings that we intend to hold in this Subcommittee on Clear Skies. It is my intention to mark-up Clear Skies at the Subcommittee level as quickly as possible and I will push hard to have the full committee report a bill to the floor—and to have the Senate pass it this Congress.

I want to thank our first witness this afternoon, Administrator Whitman, for coming to present President Bush's proposal to the Subcommittee. It is always a pleasure to have the Administrator testify before us especially on a topic as important as this one.

I look forward also to the testimony of our other witnesses and to working with the members of this Subcommittee as we move forward on this vital legislation.

Senator VOINOVICH. Senator Jeffords?

OPENING STATEMENT OF HON. JAMES M. JEFFORDS, U.S. SENATOR FROM THE STATE OF VERMONT

Senator JEFFORDS. Thank you, Senator. I am glad you are continuing to pursue multi-pollutant legislation. That's one of my favorite topics, as you well know.

Also, I am pleased that the Administrator has come by today to listen to us.

As most people know, I am a sponsor of S. 366, the Clean Power Act of 2003. This pollutant legislation has 19 other cosponsors, both Democrats and Republicans. Our bill is nearly identical to the one reported out by the committee last year. This bill basically passed the committee last year. Its ambitious deadlines show that we want to reduce emissions of core pollutants quickly to protect human health and the environment. The Administration's plan, Clear Skies, takes a different much more leisurely approach toward a few of our goals. This is troubling to me, since every moment of delay means more people that die prematurely due to power plant pollution. More acid rain will fall, and more mercury will spew into our lakes and streams, threatening children's health.

The often-quoted and peer-reviewed study of Abt Associates says that power plant pollution, mainly fin particulate matter, is caus-

ing approximately 30,000 premature deaths annually. That's happening now, and I hope everyone here considers that a crisis.

And yet, the Administration has not acted to regulate sources of this pollution under its broad authority granted by the existing Clean Air Act. One might even say that the Administration is deregulating these sources through the so-called NSR reforms and increasing pollution.

If the Administration were to act aggressively under the Clean Air Act's present authorities, according to the scenario that EPA presented to industry in the fall of 2001, then the bars in yellow on this chart are the kinds of emission levels we would see. Clearly, these levels are substantially lower than those for the pollutants under Clear Skies.

If the Adminstration were to put forward the original EPA "straw proposal"—that was the agency's interpretation in 2001 of what levels of reductions are necessary and feasible to protect public health—the numbers would be much lower than Clear Skies, almost down to the yellow levels you see on the chart.

Instead of these two decent options, the Administration has put forward Clear Skies. Apparently, the only way to make Clear Skies' levels and timing look good is to assume a "Rip Van Winkle" approach at EPA. That means that EPA would have to be essentially asleep at the switch for the next decade and not regulate any further.

We know that is ridiculous at best, given the millions of people who are and will be living in areas with unhealthy air. Indeed, today's utility witness lays out the numerous regulations which will require emission reductions from power plants over the next decade and longer.

And finally, it is "whistling past the graveyard" for the Administration to continue ignoring the need to control greenhouse gas emissions. As global warming skeptics have told us, increasing emissions increases the risk of global change. I ask that a summary of a forum on weather and climate at the National Academy of Sciences be included in the record.

[The referenced document follows:]

THE NATIONAL ACADEMIES

FROM CLIMATE TO WEATHER: IMPACTS ON SOCIETY AND ECONOMY

SUMMARY OF A FORUM
JUNE 28, 2002
WASHINGTON, DC

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

A REPORT TO THE
NATURAL DISASTERS ROUNDTABLE

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THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

National Academy of Sciences
National Academy of Engineering
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National Research Council

The National Academy of Sciences is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Bruce M. Alberts is president of the National Academy of Sciences.

The National Academy of Engineering was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievement of engineers. Dr. Wm. A. Wulf is president of the National Academy of Engineering.

The Institute of Medicine was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, upon its own initiative, to identify issues of medical care, research, and education. Dr. Harvey V. Fineberg is president of the Institute of Medicine.

The National Research Council was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both Academies and the Institute of Medicine. Dr. Bruce M. Alberts and Dr. Wm. A. Wulf are chairman and vice chairman, respectively, of the National Research Council.

FOREWORD

The Natural Disasters Roundtable seeks to facilitate and enhance communication and the exchange of ideas among scientists, practitioners, and policymakers concerned with urgent and important issues related to natural disasters. Roundtable meetings are held three times a year in Washington, DC. Each meeting is an open forum focused on a specific topic or issue selected by the NDR Steering Committee.

The NDR Steering Committee is composed of 5 appointed members and sponsoring ex officio members. At the time of this forum, the appointed members were: Rutherford H. Platt, Chair, University of Massachusetts, Amherst; James P. Bruce, Global Change Strategies International, Inc., Ottawa, Canada; Wilfred D. Iwan, California Institute of Technology, Pasadena; Stephen P. Leatherman, International Hurricane Center, Florida International University, Miami; and Mary Fran Myers, Natural Hazards Research and Applications Information Center, University of Colorado at Boulder. Ex officio members were: Stephen Ambrose, NASA, Lloyd S. Cluff, Pacific Gas & Electric; Dennis Wenger, NSF; Timothy Cohn, USGS; Margaret Lawless, FEMA; James Russell, IBHS, and Helen M. Wood, NOAA.

This paper presents the rapporteur's summary of the forum discussions and does not necessarily reflect the views of the roundtable members or other participants.

For more information on the Roundtable visit our website: http://nationalacademies.org/naturaldisasters or contact us at the address below.

Natural Disasters Roundtable
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Fax: 202-334-1961.

This summary has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the NRC's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their review of this summary:

Joan Aron, Science Communication Studies, Columbia, Maryland
Raymond Ban, The Weather Channel, Inc., Atlanta, Georgia
Benjamin Preston, Pew Center on Global Climate Change, Arlington, Virginia

The review of this summary was overseen by Marvin Geller, State University of New York, Stony Brook. Appointed by the National Research Council, he was responsible for making certain that an independent examination of this summary was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this summary rests entirely with the authoring committee and the institution.

FROM CLIMATE TO WEATHER

SUMMARY OF A FORUM

The objective of this forum was to review information on the linkages between climate variability and change and disasters due to extreme weather events. The forum provided the opportunity to discuss some of the scientific and policy implications of these linkages.

NATIONAL ASSESSMENTS AND CONGRESSIONAL RESPONSES

The first three speakers at this forum gave valuable insight into the assessments that have been conducted in the United States over the past few years. How the U.S. Congress has received these assessments and other information was also discussed.

Anthony Janetos of the Heinz Center gave an overview of the U.S. National Assessment[1] of climate variability and change. The Assessment used the Hadley Center for Climate Prediction and Research Climate Model 2 and outputs from the Canadian Climate Centre Global Climate Models (GCM) to give a range of potential future climates and their effects. He characterized the Canadian Climate Centre model as a "hot model" or a "very warm model". (Among the seven models considered by the National Assessment Synthesis Team [NAST], the Canadian Climate Centre Model produces the highest temperature for the 21st century although other models not used by the NAST can generate a greater warming.) An important finding in the National Assessment study was that derived by coupling climate model results with ecosystem models.[2] Janetos showed that even under the "cool wet" model there would be major shifts in the Eastern United States with northward migrations of ecosystems. If the 'warm' model results are used, there would be an increase in forest fire risks in the Southeastern United States in the second part of the century. The implications were rather severe in the warm model and still important in the cool model. These increasing heat indices would also affect the quality of life.

Vaughan Turekian of the National Research Council (NRC) reported on the National Academies' assessment report, *Climate Change Science: An Analysis of Some Key Issues* (NRC, 2001)[3]. This fast-track study was in response to a request from the White House to assist in identifying areas in the science of climate change

[1] The National Assessment of the Potential Consequences of Climate Variability and Change was an assessment of what we presently know about the consequences of climate variability and change. This assessment was conducted as part of the United States Global Change Research Program (USGCRP).

[2] Specifically, the climate scenario generated by the Canadian Climate Centre GCM, when combined with the MAPPS (mapped atmosphere-plant-soil) ecosystem model, shows break-up of the forests of the southeast, replaced with open parkland and in some areas, grassland. This breakup is due to fire disturbance and subsequent inability of the present forest species to reproduce in place. These simulations do not take forest management into account, so are not able to account for potential fire suppression. The results that the author cites, an overall increase in productivity for US forests, stem from a different ecosystem model that does not have the same sensitivity to altered climate, and which handles CO_2 enrichment differently. The National Assessment did not try to calculate economic damages in most instances, including this one.

[3] In the U.S. Climate Action Report (US Dept. of State, 2002), this NRC report and the National Assessment report were the basis for the discussion of climate change and its impacts.

where there are the greatest certainties and uncertainties, and "views on whether there are any substantive differences between the Intergovernmental Panel on Climate Change (IPCC) Reports and the IPCC summaries."[4] In the 2001 NRC report, the greatest uncertainties identified were mainly over the role of natural variability instead of, or in collaboration with, anthropogenic climate change. Another significant uncertainty mentioned by Turekian was identifying a safe level of greenhouse gases in the atmosphere or greenhouse gas emissions for human welfare and ecosystems. Determining a 'safe level' is in large measure region-specific with vulnerable communities tolerating only the lesser effects of greenhouse gases for example, low-lying islands and Arctic peoples. People on the island of Tuvalu would have a very different view than people in the central United States. In other words, the NRC report considered this to be a societal value-laden rather than scientific question. The IPCC's report conclusions were generally supported by the NRC report, which along with national academies from 16 other countries basically endorsed IPCC findings.

The NRC report agreed with the IPCC report that sea level will continue to rise, rainfall rates will increase in many regions and many semi-arid regions will experience more severe droughts. Much additional multi-disciplinary scientific work is needed to reduce uncertainties and to determine how serious a problem climate change may pose to the United States. Turekian noted that recent declarations from the Bush Administration, including the U.S. Environmental Protection Agency, state the recognition that climate change is a reality, produced from a build-up of greenhouse gases in the atmosphere.

The experiences with Congress that Jim Jensen (NRC) related made it clear that congressional members are very interested in disaster mitigation and are willing to support efforts in that area with better weather and hydrologic measurement and warning systems. However, Congress is not as well organized as the Administration, through the Federal Emergency Management Agency, to address natural disasters. Although two different congressional committees oversee the U.S. Geological Survey (USGS) and National Oceanic and Atmospheric Administration (NOAA) programs on climate, weather and water, the links with climate change have not been made and this is in part because Congress sees the task of trying to reduce greenhouse gases as very formidable. Jensen also made it clear that media plays an important role in how Congress is influenced in thinking about these issues. This was also emphasized by Steve Lyons of the Weather Channel in his presentation, as discussed below. In the forum discussion it was pointed out that the Kyoto Protocol would be just a small step on the way towards safe concentrations of greenhouse gases and reducing emissions to the atmosphere. He noted that impacts of climate change in Alaska and the recent wildfire season are drawing more attention from Congress to climate change.

SCIENCE AND UNCERTAINTIES

Jay Lawrimore of NOAA's National Climate Data Center noted the very serious difficulties that arise in trying to determine the past trends of extreme climatic events from the data records. These data have many problems to overcome, such as, gaps in the records and problems of inhomogeneity. Lawrimore showed convincing evidence of consistency in some climatic trends with model projections with past greenhouse-gas forcing. In particular, there have been higher maximum temperatures and even greater increases in minimum temperatures, heavier one-day rainfalls, earlier end of winter frost periods, and higher humidity in the lower layers of the atmosphere. Some of the changes in extremes that would be expected with greenhouse forcing of climate, are already evident. However, no increase in droughts has yet been detected. Trends in numbers and intensity of hurricanes are ambiguous with decadal changes being more significant than any long-term trends (see Knutson's analysis later). Lawrimore pointed out that trends in human vulnerability to some climatic extremes (e.g. heat waves affecting elderly and poor) are in many cases

[4] The scope of this presentation is only the report from IPCC Working Group I (http://www.ipcc.ch/).

more important than climatic trends. Better data sets and data management are needed to resolve many issues.

Tony Busalacchi (University of Maryland) discussed the El Niño, La Niña, Pacific Decadal Oscillation and the North Atlantic and Arctic Oscillations. These large-scale natural modes of climate variability are linked to climate extremes in many regions of the world in complex ways. For example, El Niño events are linked to fewer Atlantic hurricanes and reduced tornado activity in Louisiana. On the one hand, modeling of these phenomena can lead to valuable seasonal forecasts of drought and flood conditions, but on the other hand, modeling for some regions (e.g., Africa) is not very reliable. A key issue that scientists are struggling with is, "How are global warming and seasonal and also intraseasonal variations connected to each other?"

Howard Bluestein, University of Oklahoma, reminded the audience with some dramatic photos of the devastation that tornadoes, hail, supercells, and other severe thunderstorms can bring. Supercells last longer than ordinary thunderstorms and are the most prolific producers of tornadoes and hail. On average, there are 1,000 tornadoes that occur each year in the United States but only 536 occurred during 2002[5] These numbers vary depending on distribution of low-level water vapor, and the difference between surface and upper air temperatures, and the vertical wind shear. Bluestein and others pointed out that there is no evidence of change so far in the frequency or distribution of tornadoes. The climate models are far too coarse in scale to make a prediction of tornadoes or their parent storms. In the discussion it was noted that the modeled future changes suggest an increase in conditions under which supercells capable of producing tornadoes, may form. Models project a warmer lower atmosphere and cooling in the upper atmosphere, and an increase in low-level water vapor, which are conditions favorable to the formation of storms that can spawn supercell tornadoes. However, reliable wind shear predictions are probably beyond the realm of modeling capability at this stage.

Tom Knutson of NOAA's Geophysical Fluid Dynamics Lab (GFDL) took on the difficult task of summarizing the actual and potential trends in tropical cyclones (tropical depressions, tropical storms, and hurricanes) in a changing climate. Although warming sea surfaces could add to tropical cyclone intensities, there appears to have been no significant trends to date in frequency, intensity and area of effect from hurricanes or tropical storms. Knutson presented some careful modeling work to show the most plausible outcome by year 2100. In a greenhouse forced climate it is predicted that there will be a 5-10 percent increase in the intensity of the winds in the most intense hurricanes and a 15-30 percent increase in precipitation in the most severe storms (with the range depending on the type of precipitation measure evaluated). A ten percent increase in the wind speed may not appear significant but Alan Davenport of the Institute for Catastrophic Loss Reduction (London, Ont.) noted that this means there would be at least a 20 percent or maybe larger, increase in the windforce stress on structures. Harold Cochrane of Colorado State University noted later that a 1 percent increase in windspeed in Florida gave a 10 percent increase in damage, so that the damages from a 10 percent increase in the intensity of the most intense tropical cyclones or hurricanes could be very great. In addition, the increase in height of ocean storm surges has a greater than linear relation to windspeed. For the recent hurricanes in Honduras and in southeastern United States, the rain and floods caused more damage than the winds. Therefore, an increase of 15-30 percent in rainfall in severe hurricanes could be equally devastating. If these severe storms should develop, even Knutson's modest projected increases could be very serious for disaster losses.

Francis Zweirs of the Canadian Climate Centre for Modeling and Analysis, Victoria, reviewed many of the problems faced in climate data analysis and modeling future climate. Data for model verification are at times unavailable or of questionable quality, especially for extreme events. Zweirs showed that modeling extreme events using GCMs can be very difficult and complex, but not impossible. The Canadian Climate Model predicts that rains with an 80-year return period would become 25-year events by the end of the 21st century if the climate is forced according to the IPCC IS92a emissions scenario. (The IPCC (1992) developed

[5] These numbers are still preliminary for 2002. See the National Weather Service/Storm Prediction Center website for updates http://www.spc.noaa.gov/climo/torn/monthlytornstats.html.

a range of scenarios, IS92a-f, of future greenhouse gas and aerosol precursor emissions based on assumptions concerning population and economic growth, land use, technological changes, energy availability, and fuel mix during the period 1990 to 2100. Scenario IS92a is a mid-range emissions scenario.) This change in the frequency of high intensity rainfalls has enormous implications for storm drainage design and flash floods, for erosion and erosion control, and other events and their associated controls that are greatly influenced by high rain intensities. According to predictions for maximum temperatures, 20-year return period values would go up some 4-6° C over most of North America and as much as 10° C in southeast United States. Minimum temperature extremes would rise with greater intensity.

In the discussion of this presentation, it was noted that in the Canadian model the most severe winter storms are increasing in intensity although the number of storms is not increasing. It was pointed out that models tend to simulate a smooth response in global mean temperature to IS92a forcing. However, looking at how temperature evolves at individual grid points or in regions, it can be seen that the response is not smoothly upwards because the local temperature is a combination of the warming signal and a lot of natural variability. There has been considerable investigation of abrupt changes in the global mean temperature using models that have evaluated scenarios under which the thermohaline circulation might suddenly collapse. However, as Bob Hirsch (USGS and Chair of the session) and others pointed out the paleo record makes it clear that very abrupt changes in climate over short periods of time have occurred in the past. Caution should be used when assuming that changes are going to occur in a steady smooth way.

FRAMING POLICY IMPLICATIONS

William Hooke of American Meteorological Society, who chaired this session, noted that given the evidence so far, climate change may be a more important issue for local government officials than for federal politicians and officials.[6]

David Changnon, Northern Illinois University, noted that most of the disaster loss increases in the United States, except for those due to heavy rains or floods, are due to changes in where we live and changes in how we live. This suggests that better prevention measures can achieve a reduction in disaster losses. For instance, the annual average number of thunderstorms has not increased and while hail is more frequent in a few regions of the United States, the frequency of very severe tornadoes (F4 and F5) has appeared to decline. Changes in society are major factors in disaster losses. For example, from 1960 to 1975 property loss was 42 percent of total U.S. insured hail losses and crop losses were 58 percent. Over the past decade, the ratio has nearly reversed for the two categories with 61 percent of total U.S. insured hail losses attributed to property losses and 39 percent related to crop losses. Large property losses are also due to the increase over the past 30 years of expensive buildings constructed in flood plains, along vulnerable coasts, and in densely-packed urban areas—some have called this "mansionization".

Harold Cochrane, Colorado State University, showed that estimates of direct and indirect economic losses is not a simple matter, requiring closer examination of methods to calculate these losses. He suggested a way to reduce vulnerability following the idea that the best-built structures withstand major damages. As an example, many blamed the years of lax enforcement of building inspections and enforcement of building codes for much of the $15-20 billion insured losses caused by Hurricane Andrew in Florida in 1992. He claimed that this is a myth since the age of damaged structures was not relevant in explaining losses. Although a few local companies filed for bankruptcy after Hurricane Andrew, the insurance losses were mostly

[6] Note: As a confirmation of this the Federation of Canadian Municipalities (with 84 percent in favor) called on the Canadian government to ratify the Kyoto protocol, while many industrial groups are urging against such ratification.

localized and did not have big economic impacts on the national economy. Cochrane suggested that insurance rate incentives could encourage citizens to take preventive measures. For disaster mitigation activities preventive measures through incentives are worth exploring. Using insurance rates as incentives to plan for climate variability and change should be used with prudence, however. As insurance can have positive behavioral effect, it can also produce unwanted results, e.g., the national flood insurance program has allowed affected communities to rebuild homes in areas with high flood risks.

Tom Wilbanks of Oak Ridge National Laboratory began his presentation by emphasizing the many ways that climate and weather are important to all of us including the non-human inhabitants of the planet. Wilbanks then discussed sensitivity, exposure, and resilience and the thresholds of vulnerability in adaptation measures and disaster mitigation. He pointed out that in Cochin, India, self-assessment tools are being developed that should be very valuable both there and elsewhere. Cochin is a city of 1.5 million in Kerala on the west coast of India and is particularly vulnerable to sea level rise and storm surges both of which will affect the city's tourism, shipping and canal traffic sectors. Although, mitigation of climate change (actions to reduce climate change) is considered by some as a more important strategy than adaptation (disaster prevention), both strategies are in fact complementary. Wilbanks said that some mitigation could make adaptation possible because adaptation can then address less extreme climatic changes. However, Wilbanks considered adaptation measures to be of higher importance for such communities like Cochin.

Ian Burton's (recently of Environment Canada and University of Toronto) first message was "adapt and thrive". Noting that losses due to climate related disasters are rising globally, he emphasized the need to bring the climate adaptation and disaster mitigation communities together. He noted that if we adapted better to climatic events of the past few decades, we would now be well on the way to adapt to long-term climate change. Burton discussed the need to reduce mal-adaptation. He also spoke about the need to look at present and future vulnerability, as society and infrastructures changes. Although the United States has unequalled capacity to adapt, it has not always done so. This is evident in the fact that disaster losses continue to rise, which may be due in part to a failure to adapt or an increase in maladaptation. In providing assistance to developing countries to strengthen adaptive capacity it should be recognized that greater wealth, technology, and social organization are not guarantees of effective adaptation. A broader approach based upon political will, a culture of mitigation and adaptation, and integration with sustainable development are all needed as well.

Steve Lyons of the Weather Channel gave a presentation on the role of the media. He reinforced the importance of the media to policymakers and lessons learned from weather forecast dissemination. Lyons emphasized that not all problems of forecasting are from models. When forecasting one would need to know the information base of the audience in order to assess and explain uncertainty clearly. He gave a graphic demonstration that landfall hurricanes in the United States are only 16 percent of the total number of Atlantic storms yet some storms at sea can still cause major coastal damage and this type of information needs careful public presentation. Communicators should not go beyond the knowledge they have and should explain the potential impacts of an event. He noted that there may be a bias in the media (even the Weather Channel) towards news of bad weather, but responsible journalists and commentators try to correct for this to ensure the all important high credibility with viewers.

WRAP-UP

James Bruce of Global Change Strategies International, Ottawa, and member of the Natural Disasters Roundtable, summarized some of the key observations made at the forum.

- There is a need for better interaction between the climate change community, the seasonal forecast community, weather forecasters, and the natural disaster reduction community. All of these stakeholders were represented at the forum.

- There is a need for improved models for climate change projections involving the nature of land cover, the biological aspects of the land, oceans and the geochemical cycles.

- The climate analysts indicated that some extreme weather events, such as heavy rainfalls and maximum and minimum temperatures, appear to be increasing, as was projected by climate models. But for other events there are either no recognizable trends or natural variability is so great that it will probably be some time before patterns can be detected. Improved models would be helpful.

- While climate modelers suggest some extreme events are likely to increase in a greenhouse gas-forced world, and this appear to be beginning, a close watch needs to be kept on the relative importance of hazard severity, and exposure to risk. Some increase in disaster losses might best be explained by increased exposure to risks such as building on coasts and flood plains. Understanding of the relative importance of these factors requires more systematic research.

- Adapting to the present range of weather extremes requires more effective disaster-loss prevention measures. Adapting to the extremes of climate as it evolves in order to reduce human suffering and economic losses is also a great challenge.

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APPENDIX A

AGENDA

NATURAL DISASTERS ROUNDTABLE
June 28, 2002
Washington, DC

Forum on
From Climate to Weather:
Impacts on Society and Economy

8:30 AM Welcome and Introductions
Rutherford Platt, NDR Chair

8:45 AM Lessons from U.S. National Assessment
Anthony Janetos, Heinz Center for Science, Economics, and the Environment

9:05 AM Lessons from the NAS Assessment
Vaughan Turekian, National Research Council

9:25 AM Role of Congress in Shaping Policy Regarding Extreme Events
Jim Jensen, National Research Council

9:45 AM Discussion

10:00 AM Break

10:15 AM Panel on Understanding the Science and Uncertainties
Chair, Robert Hirsch, USGS

10:20 AM Climate Record and Extreme Weather
Jay Lawrimore, National Climatic Data Center, NOAA

10:40 AM Role of Natural Modes of Variability in Influencing Extreme Events
Antonio Busalacchi, University of Maryland

11:00 AM Role of Climate Change in Severe Weather Events
Howard Bluestein, University of Oklahoma

11:20 AM Role of Climate Change on Tropical Cyclones
Tom Knutson, Geophysical Fluid Dynamics Laboratory/NOAA

11:40 AM Extreme Weather Projections from Climate Models
Francis Zwiers, Canadian Climate Centre for Modeling and Analysis

12:00 Noon Panel Discussion

12:30 PM	Lunch (cafeteria available)
1:30 PM	Framing Policy Implications Chair, *William Hooke, American Meteorological Society*
1:40 PM	Societal Impacts – Sorting Out Increased Vulnerability from Changes in Extremes *David Changnon*, Northern Illinois University
2:00 PM	Economic Impacts of Extreme Weather Events *Harold Cochrane*, Colorado State University
2:20 PM	Human Vulnerability and Adapting to Climate Change *Thomas Wilbanks*, Oakridge National Laboratory
2:40 PM	Adaptation and Resilience ("No Regrets" Strategy) *Ian Burton*, Environment Canada
3:00 PM	Role of Media in Public Education and Perception *Steve Lyons, The Weather Channel*
3:20 PM	Panel Discussion
4:00 PM	Wrap up *James P. Bruce, Global Change Strategies International, Inc.*
4:20 PM	Adjourn

APPENDIX B

BIOGRAPHICAL INFORMATION

Howard B. Bluestein is Professor of Meteorology at the University of Oklahoma, where he has served since 1976. His research interests are the observation and physical understanding of weather phenomena on convective, mesoscale, and synoptic scales. Bluestein is a fellow of the American Meteorological Society (AMS) and the Cooperative Institute for Mesoscale Meteorological Studies. He is past chair of the NSF Observing Facilities Advisory Panel, the AMS Committee on Severe Local Storms, and UCAR's Scientific Program Evaluation Committee, and a past member of the AMS Board of Meteorological and Oceanographic Education in Universities. He is also the author of a textbook on synoptic-dynamic meteorology and Tornado Alley, a book for the scientific layperson on severe thunderstorms and tornadoes. He received his Ph.D. in meteorology from the Massachusetts Institute of Technology.

James Bruce is the Senior Associate for Global Change Strategies International, Inc. in Ottawa, Canada. In his early professional life, he was a weather forecaster, established the flood warning system for the province of Ontario, and undertook research and teaching in hydrometeorology. Since then, he has held many positions, including being the Acting Deputy Secretary-General of the World Meteorological Organization, Geneva during which he assisted the Secretary-General in overseeing the establishment of the Intergovernmental Panel on Climate Change and the Global Atmosphere Watch for assessment of chemical changes in the Earth's atmosphere. Mr. Bruce has written several books, papers and articles, especially on climate change, environmental management, water resources, and disaster mitigation.

Ian Burton is an independent scholar and consultant. He holds several honorary positions including Scientist Emeritus in Environment Canada; and Emeritus Professor at the University of Toronto. He has recently served as a member of the Independent World Commission on the Oceans and is on the editorial board of three scientific journals including *Mitigation and Adaptation to Global Change* (Kluwer) and *Global Environmental Change* (Pergamon) as well as the *International Journal of Biometeorology*. Recent assignments include technical assistance to the UNEP (United Nations Environment Programme) Country Studies Programme on Climate Change Impacts and Adaptation; the GEF (Global Environment Facility) on the costs of adaptation; the World Resources Institute on climate change and economic development in Africa; the IPCC (Intergovernmental Panel on Climate Change) Expert Group on Adaptation; the European Commission in Brussels; and the World Bank on the inclusion of climate impact assessment considerations in Bank investments.

Antonio J. Busalacchi, Jr. is the founding director of the Earth System Science Interdisciplinary Center (ESSIC) at the University of Maryland College Park and Professor in the Department of Meteorology. ESSIC is a joint center among the Departments of Meteorology, Geology, and Geography at the University of Maryland in collaboration with the Earth Sciences Directorate at NASA's Goodard Space Flight Center. Dr. Busalacchi began his professional career as an oceanographer at the NASA/Goodard Space Flight Center. In 1991, he was appointed to the Senior Executive Service in the U.S. Government as the Chief of the NASA/Goodard Laboratory for Hydrospheric Processes. In that capacity he furnished scientific direction to a broad, many-faceted program in Earth system science.

David Changnon is an atmospheric scientist specializing in climatological studies in the Department of Geography at Northern Illinois University (NIU). After receiving his PhD in atmospheric sciences in 1991

from Colorado State University, he spent two years at the Southeast Regional Climate Center in Columbia, South Carolina, before taking an academic position at NIU. His major expertise rests in developing climatological information and models for use by weather-sensitive decision makers in agriculture, utilities, insurance, and transportation. He has developed an innovative new "education-to-career" program to train students and simultaneously solve climatological problems facing government and private industry. He has served on various committees of two scientific societies. His research interests also involve the spatial and temporal variability of climate extremes in the U.S. Changnon is the author or co-author on over 30 journal articles, book chapters, and other refereed publications. He has participated in a number of climate change workshops including the July 1998 summer session of the Aspen Global Change Institute titled "Climate extremes: Changes, impacts, and projections." Recently he was involved in a project examining the use of El Niño-based seasonal forecasts by decision makers during the 1997-98 El Niño.

Harold C. Cochrane is Professor in the Department of Economics at Colorado State University where . He has been at Colorado State since 1974 and he teaches environmental and natural resource economics, energy economics, and macroeconomic theory. He has worked extensively in the field of natural and man-made hazards and has served on a number of National Academy of Sciences and National Research Council committees. He is the Director of Colorado State's Hazards Assessment Laboratory. He holds a B.S. in Industrial Engineering from Pennsylvania State University and a Ph.D. in economics from the University of Colorado.

Robert M. Hirsch is Associate Director for Water with the U.S. Geological Survey. Hirsch began his career with the USGS in 1976 as a hydrologist. He conducted and directed research leading to methods for analysis of: the risk of water-supply shortages, water-quality trends, transport of pollutants in rivers, and flood frequency. He also was instrumental in the design and initiation of USGS programs including the National Water-Quality Assessment Program, Global Change Hydrology Program, and Watershed Modeling Systems Program. He has served as Chief, Branch of Systems Analysis of the Water Resources Division, USGS, Staff Assistant to the Assistant Secretary for Water and Science, and Assistant Chief Hydrologist for Research and External Coordination of the USGS. From August 1993 to March 1994, he served as the Acting Director of the USGS. In June 1994, he became Chief Hydrologist of the Water Resources Division. He is a recipient of the Department of the Interior Distinguished Service Award, was conferred the rank of Meritorious Executive by the President of the United States, and was elected a Fellow of the American Association for the Advancement of Science. He is a recipient of the Water Management Achievement Award from the Interstate Council on Water Policy. He received his BA in Geology from Earlham College, an MS in Geology from the University of Washington, and a Ph.D. in Geography and Environmental Engineering from Johns Hopkins University.

William H. Hooke is a Senior Policy Fellow and the Director of the Atmospheric Policy Program at the American Meteorological Society in Washington, DC. Prior to arriving at AMS in 2000, he worked for the National Oceanic and Atmospheric Administration (NOAA) and antecedent agencies for 33 years. After six years of research with NOAA he moved into a series of management positions of increasing scope and responsibility including Chief of the Wave Propagation Laboratory Atmospheric Studies Branch, Director of NOAA's Environmental Sciences Group (now the Forecast Systems Lab), Deputy Chief Scientist, and Acting Chief Scientist of NOAA. Between 1993 and 2000, he held two national responsibilities: Director of the U.S. Weather Research Program Office, and Chair of the interagency Subcommittee for Natural Disaster Reduction of the National Science and Technology Council Committee on Environment and Natural Resources. Dr. Hooke was an faculty member at the University of Colorado from 1969 to 1987, and served as a fellow of two NOAA Joint Institutes (CIRES, 1971-1977; CIRA 1987-2000). The author of over fifty refereed publications, and co-author of one book, Dr. Hooke holds a B.S. (Physics Honors) from Swarthmore College (1964), and S.M. (1966) and Ph.D (1967) degrees from the University of Chicago.

Anthony Janetos is Senior Fellow at the H. John Heinz III Center for Science, Economics, and the Environment. Before working with the Heinz Center, Dr. Janetos was Vice President/Chief of Science and Research at World Resources Institute. He was co-chair of the U.S. National Assessment of the Potential

Consequences of Climate Variability and Change. His prior jobs include senior scientist at the National Aeronautics and Space Administration. Dr. Janetos graduated Magna cum Laude from Harvard College with a bachelor's degree in biology, and earned a master's degree and a Ph.D. in biology from Princeton University.

James E. Jensen is Director of the Office of Congressional and Government Affairs of the National Research Council of the National Academy of Sciences, National Academy of Engineering and Institute of Medicine. From 1987-1995, Mr. Jensen was the Director of Congressional and Public Affairs at the Office of Technology Assessment at the U.S. Congress. In the decade prior to that, he worked on a variety of science and technology issues as a member of the professional staff of the House Committee on Science and Technology and the Senate Committee on Governmental Affairs. Mr. Jensen worked on the Clinton-Gore transition team for science and technology and was a Fellow at the National Center for Atmospheric Research for one year. He holds an A.B. in American Political History from the University of California at Berkeley.

Thomas Knutson is a research meteorologist in the Climate Dynamics and Prediction Group at the National Oceanic and Atmospheric Administration's Geophysical Fluid Dynamics Laboratory - one of the world's leading climate modeling centers. He has been author or co-author of 15 publications in major climate journals, including papers in Science on future hurricane intensities with global warming and (with T. Delworth) on simulation of early 20th century global warming. His recent research interests include: the impact of climate change on hurricane intensities and detection of climate change. He has been an invited expert at several workshops on climate change and extreme events (or tropical cyclones) including at the Aspen Global Change Institute, the Risk Prediction Initiative at the Bermuda Biological Station for Research, the U.S. Environmental Protection Agency, and the American Meteorological Society Conference on Hurricanes and Tropical Meteorology. He was an invited speaker and breakout session chair for the Tropical Cyclones Session at a recent Workshop on Changes in Extreme Weather and Climate Events organized by the Intergovernmental Panel on Climate Change.

Jay Lawrimore became Chief of the Climate Monitoring Branch at the National Climatic Data Center (NCDC) in May 2000. He was a Meteorologist with the North Carolina Division of Air Quality before joining NCDC in 1998. He was a contributing author to the IPCC Third Assessment - Climate Change 2001 and has been lead author on articles published in journals such as the Bulletin of the American Meteorological Society, Journal of Geophysical Research, Journal of Hydrometeorology, and Chemosphere. As Chief of the Climate Monitoring Branch, Mr. Lawrimore leads a team focused on providing access to high quality climate information while performing analyses to place the current weather and climate in historical perspective. The climate monitoring team also provides links between weather and climate and those sectors of the Nation's economy that are weather sensitive, while also working to develop a network monitoring and performance indicator access system which will provide early detection of time-dependent biases and other network problems. He holds an M.S. in Atmospheric Science from North Carolina State University.

Steve Lyons is a tropical weather expert with The Weather Channel. His expertise is in tropical and marine meteorology. He has participated in more than 25 national and international conferences and provided World Meteorological Organization training courses in marine meteorology, tropical meteorology and ocean wave forecasting. Prior to joining The Weather Channel in April 1998, Steve managed the Tropical Analysis and Forecast Branch of the Tropical Prediction Center, National Hurricane Center. He has worked directly for private weather companies and traveled around the world forecasting weather in various tropical locales. Dr. Lyons has also been a private consultant forecasting ocean waves for numerous surfing beaches. Among his many interesting jobs, he has been a research scientist for the U.S. Navy, for the Geophysical Fluid Dynamics Laboratory at Princeton University, and for the University of California at Los Angeles. He has also been a professor of meteorology at Texas A&M University and at the University of Hawaii. Dr. Lyons also worked for the National Weather Service South Region Scientific Services Division, where he trained NWS meteorologists. He has published more than 20 papers in scientific journals, and written more than 40

technical reports and articles for the National Weather Service and the Navy. He holds a Ph.D. in Meteorology from the University of Hawaii.

Rutherford H. Platt is a Professor of Geography and Planning Law at the University of Massachusetts at Amherst, and Chair of the Natural Disasters Roundtable. He has served on other NRC committees including the Committee on Flood Insurance Studies, the Committee on Water Resources Research Review, the Committee on a Levee Policy for the National Flood Insurance Program, the Committee on Managing Coastal Erosion, and the Committee to Review the New York City Watershed Management Plan. He also has chaired the NRC Committees on Options to Preserve the Cape Hatteras Lighthouse and Flood Control Alternatives in the American River Basin, and he is a current member of the Water Science and Technology Board. Dr. Platt recently authored, *Disasters and Democracy: The Politics of Extreme Natural Events.*

Vaughan C. Turekian is a program officer in the National Academy of Science's Board on Atmospheric Sciences and Climate and the Program Director for the Committee on Global Change Research. Dr. Turekian has been study director for a number of NAS studies including the recent Climate Change Science report requested by the White House. He received his B.S. degree from Yale University in geology and geophysics and international studies and his Ph.D. in environmental sciences from the University of Virginia.

Thomas J. Wilbanks is the corporate research fellow and manager of Developing Country Programs at the Oak Ridge National Laboratory in Oak Ridge, Tennessee. His research interests include the potential of energy technologies to reduce greenhouse gas emissions from developing countries and emerging economies; the US national assessment of climate variability and change; energy, environment, and technology planning; and issues of sustainable development. He is a past president of the Association of American Geographers, a recipient of the National Geographic Society's Distinguished Geography Educator's Award, and a fellow of the American Association for the Advancement of Science. He has served on several committees of the National Research Council. He received a BA in social sciences from Trinity University, and a MA and PhD degrees in geography from Syracuse University.

Francis Zweirs currently holds the post of Chief of the Canadian Centre for Climate Modeling and Analysis - a division of the Climate Research Branch of the Meteorological Service of Canada - stationed in Victoria, British Columbia. Dr. Zweirs is an editor of the Journal of Climate, and a lead author of the climate change detection and attribution chapter in the Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report. Dr. Zweirs earned his PhD in statistics from Dalhousie University in 1980.

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Senator JEFFORDS. Omitting carbon dioxide from a long-term emissions control program; that will drive investments makes no sense from a financial or an environmental perspective. As the CEO from Cinergy will tell us, and has told us in the past, certainty is important. The Administration has not provided certainty on carbon.

In its legislation the Administration asks Congress to do away with or downgrade the numerous programs that Congress established to protect local and regional air quality and to push control technology forward. This includes hurting States' ability to stop interstate pollution, cutting provisions to protect air quality and

visibility in the National Parks, and delaying air toxics reduction efforts.

In this legislation the Administration has asked Congress to extend attainment deadlines beyond current law, so people will breath unhealthy and smoggy air even longer. They want us to adopt a host of weak emissions performance standards, even weaker than current practice. These are supposed to take the place of the New Source Review requirements and are unrelated to local air quality needs.

In exchange for all of this deregulation, we will get caps that are not adequate or timely enough to save all the saveable lives and protect the environment, and these caps will not stimulate the technological development that will allow us to use our vast coal resources safely and effectively.

Obviously, this exchange isn't acceptable at all of the supporters of my bill, and Clear Skies will not become law. But, as I have said several times over the last 2 years, I am more than happy to collaborate with the Administration and all of the interested parties to move comprehensive 4-pollutant or 3.5-pollutant legislation. It could become law quickly with Administration support; so far, however, my offer of compromise has been treated with silence or disdain.

Finally, on an unrelated note, while the Administration is here, I want to say that I appreciate the EPA's efforts to take immediate emergency action at the Elizabeth Mine Superfund site in Vermont, in the agency's words to address "the potential for a slope failure and tailing flood wave" of up to 1 million cubic yards if contaminated mill tailings. That is unacceptable; they are willing to try to help us with it, and we appreciate it.

Elizabeth Mine is one of only seven sites on the National Priorities List that received no funds in fiscal year 2002. Had the Administration fully funded the Superfund Program and renewed the Superfund fees, the current emergency could likely have been avoided.

I look forward to working with you and your staff to ensure that we don't face a similar emergency during next year's spring thaw.

Thank you, Mr. Chairman.

Senator VOINOVICH. Thank you, Senator Jeffords.

Now I would like to call on the ranking member of the subcommittee, Senator Carper.

OPENING STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR FROM THE STATE OF DELAWARE

Senator CARPER. Mr. Chairman, thank you for holding this hearing today.

I want to welcome Governor Whitman to head up this hearing, and all the other witnesses. We are glad you are with us on this important issue.

I want to thank our chairman for holding this hearing today. He has had a full day of providing leadership on hearings. This one is important and near and dear to his heart, and this one is certainly near and dear to mine.

To follow up on what Senator Jeffords said, I think there is room for an alternative here. There is room for a third way, and my hope

is that we can work really hard on both sides of the aisle with the Administration to find the third way, which would include 4–P. We will see how it unfolds.

I think this is going to be the beginning of a productive discussion on how we can address our shared goals of continued progress toward cleaner air. Power plants are just one element of that effort, and what we do to address them will set a model for the debate on other sources of pollution, such as cars, as well as debate in other countries, including India and China, who are watching our efforts closely.

I expect that today we will hear debated questions about the levels of pollution reductions and deadlines established in the various bills. I will make it clear that I believe that the Clear Skies bill just doesn't go far enough. It doesn't go fast enough to be considered a truly serious effort.

On the other hand, we need to be sure that we here in this committee—and here in the Senate, and here in the Congress—don't set standards that are so tight or so fast that they are unacheivable by any significant portion of the industry. Along with Senators Judd Gregg and Lincoln Chafee, I have developed a 4–P proposal, a Clean Air Planning Act that we should consider, as I said earlier, a middle-ground-approach, a centrist approach, and we are going to be introducing it tomorrow.

Today's hearing, though is about the President's plan. I am not going to try to steal any spotlight—I'm tempted to, but I'm not going to try to steal any spotlight to describe our bipartisan alternative. However, I am convinced that the results that would occur if Clear Skies were to pass would be a step backward from our current laws and would ultimately lead to higher costs for all of us because of unnecessary delays. I am also convinced that we can do better, and that's why we have developed our approach. I believe it is decompromise.

A critical issue is how a multipollutant proposal, whether it is 3 or 4, will impact the diversity of fuel used to generate electricity in this country. Today, a bit more than 52 percent of our electricity is generated by coal; approximately 16 percent from natural gas; roughly 22 percent from nuclear, with the remainder from hydropower or renewables. Twenty years from now, I believe we an—and I believe we should—have a similarly diverse fuel supply. We could achieve such a diverse position and still address CO_2. We can have a 4–P bill, such as our Clean Air Planning Act, and still enjoy the benefits that our domestic coal supply offers.

Analysis that I have seen suggests that the Clean Air Planning Act would result in a similar generation of fuel mix by 2020, with only a slightly larger shift to natural gas from coal, maybe 3 percent, under our Clean Air Planning Act, when compared to Clear Skies in 2020. And this is with controls on carbon, and timelines are 5 years sooner than those proposed by the Administration.

Well, this is an important debate, as we all know. I suggest that we agree, maybe from the outset, on four principles to help guide our debate, and here they are.

No. 1, 4 is better than 3. A comprehensive 4 emissions strategy that includes carbon reductions will provide regulatory certainty and offer the greatest environmental and economic benefits.

No. 2, markets do work. Cap and trade-based emission standards provide the maximum incentive to achieve cleaner power.

No. 3, stairs are better than cliffs. Prompt but gradual reductions through multiphase or declining caps are more desireable than single-phased cuts.

And No. 4, eliminate redundancy only when emission reductions are secured. Existing regulatory programs, such as New Source Review, will need some modernization on my view in light of tight emission caps that we should put in place.

Thanks, Mr. Chairman.

Senator VOINOVICH. Thank you.

Senator Thomas?

OPENING STATEMENT OF HON. CRAIG THOMAS, U.S. SENATOR FROM THE STATE OF WYOMING

Senator THOMAS. Thank you, Mr. Chairman.

I will try to be fairly brief, Administrator, so that you will get a chance, perhaps, to talk.

The issue of clean air is of great importance to all of us, of course, and I am very grateful for the proposal that you have brought forth, and the Administration. I think it is a move in the right direction.

I want to talk a little bit about the fact that it affects us differently in different parts of the country. I spent this morning on the Energy Committee, talking about an energy policy; and all of these things kind of go together, as a matter of fact. Wyoming has some of the cleanest air and the world's most vast resources of coal and natural gas, as well as other resources; as you know, the quality issues differ in the west than they do in the east. In part because of our abundance of low-sulfur coal, we don't have acid rain. We don't have ozone nonattainment areas due to power plants. We don't have fine particle problems. We do have an issue with visibility. This has been addressed on a regionwide basis through the WRAP program, which puts in place a program to reduce SO_2 emissions over the next 15 years. I am pleased that Clear Skies embraces the WRAP program for the west.

I am also pleased that the Administration endorses a separate western NOx program so that costly controls that may be necessary to address health risks of ozone nonattainment in the east are not mandated in the west.

I wanted to discuss how to address the additions of Oklahoma and Kansas to the western NOx zone. When the change was made in the Clear Skies legislation this year,a the NOx allowances for Kansas and Oklahoma were left in the east. This action has produced an unfair situation for us in the west, and I think we need to correct the map.

The west also has a difference from the east and the midwest with respect to mercury. The mercury emitted from sub-bituminous coal and lignite that we burn in the west is quite small in volume and different in form than the mercury emissions produced when eastern bituminous coal is burned. Western mercury emissions aren't typically captured in scrubbers, so there is little "co-benefit" in reducing emissions of mercury by installing scrubbers for SO_2. We must determine how Clear Skies can accommodate the unique

circumstances associated with mercury emissions from western coal.

It is my understanding that EPA modeling projects that power plants will reduce mercury emissions by switching from sub-bituminous coal to bituminous coal. I am deeply concerned about that as a dramatic change, and don't believe it is in the best interest of energy and environmental policies.

Currently, generation of electricity from coal represents more than 50 percent, as we have heard. Making massive changes in the regulatory structure would have a devastating impact on the Nation's reliable energy. Also, major fuel switching to natural gas has occurred, and experts agree that we will have a shortage.

I think we have to look at the big picture where we do what we have to, and be realistic about where we can be in the next 20 years.

So thank you for being here, and I look forward to working with you.

[The prepared statement of Senator Thomas follows:]

STATEMENT OF HON. CRAIG THOMAS, U.S. SENATOR FROM THE STATE OF WYOMING

Mr. Chairman, thank you for holding this hearing today on the Clear Skies proposal. The issue of clean air is of great importance to the entire nation, but particularly to the West and my State of Wyoming where we have some the nation's cleanest air and world-class reserves of coal and natural gas, as well as wind resources. As you know, air quality issues are different in the West than they are in the East. In part, because of our abundance of low-sulfur coal, we don't have acid rain. We don't have ozone non-attainment areas due to power plants (Southern California and Phoenix have a problem due to mobile sources). And, we don't have fine particle problems.

We do, however, have an issue with visibility, and we have addressed that on a region-wide basis through the Western Regional Air Partnership (WRAP), which has put in place a program to reduce SO_2 emissions over the next 15 years. I was pleased to see the Clear Skies Act embraces the WRAP program for SO_2 in the West. I am also pleased that the Administration endorses a separate Western NOx program, so that costly controls that may be necessary to address health risks of ozone nonattainment in the East are not mandated in the West.

On that note, I wanted to discuss how to address the additions of Oklahoma and Kansas to the Western NOx zone.. When the change was made in the Clear Skies legislation this year, the NOx allowances for Kansas and Oklahoma were left in the East. This action has produced an unfair situation for us in the West.

In addition to being different with respect to SO_2 and NOx, the West also is different from the East and Midwest with respect to mercury. The mercury emitted from sub-bituminous coal and the lignite that we burn in the West is quite small in volume, and different in form from the mercury emissions produced when Eastern bituminous coal is burned. Western mercury emissions aren't typically captured in scrubbers, so there is little "co-benefit" in reduced emissions of mercury from installing scrubbers to reduce SO_2. We must determine how Clear Skies can accommodate the unique circumstances associated with mercury emissions from Western coal.

It is my understanding that EPA modeling now confirms that reducing mercury emissions from the 48 tons or so that the Nation emits today, to 26 tons in 2010, will require far more than application of controls to meet SO_2 and NOx requirements. Instead, EPA modeling projects that power plants will reduce mercury emissions by switching from sub-bituminous coal to bituminous coal.

I am deeply concerned about this dramatic change and do not believe this is in the best interest of our energy and environmental policies. Currently, generation of electricity from coal represents more than 50 percent. Making massive shifts in our regulatory structure could have devastating impacts on our nation's most reliable energy source. Already, major fuel switching to natural gas has occurred and experts agree that we will have a shortage. I think we must look at the big picture and look at where we want to be, and realistically where we can be, in 20 years.

Thank you and I welcome the witnesses and the Administrator's comments on these issues.

Senator VOINOVICH. Senator Cornyn?

Senator CORNYN. Mr. Chairman, in the interests of time and getting to the questions, I will yield my time.

Senator VOINOVICH. I just want to note that at the beginning, Administrator Whitman will take one question from the chairman and one from Senator Carper, and after that she is going to leave and Assistant Administrator Holmstead will remain to answer any other questions that the subcommittee has.

We are very happy to have you here with us. Thank you for serving our country.

STATEMENT OF HON. CHRISTINE TODD WHITMAN, ADMINISTRATOR, UNITED STATES ENVIRONMENTAL PROTECTION AGENCY ACCOMPANIED BY: JEFFREY HOLMSTEAD, ASSISTANT ADMINISTRATOR FOR AIR AND RADIATION, ENVIRONMENTAL PROTECTION AGENCY

Administrator WHITMAN. Members of the committee, I am very happy to be here at what is the beginning, I believe, of an extraordinarily important process to address the President's Clear Skies Act of 2003, legislation that will provide cleaner air for all Americans. I do hope that this is the beginning of the process that will enable us to see a 3-pollutant bill enacted this year.

Since the Clean Air Act was enacted in 1970, we've gone a long way in reversing the environmental damage that decades of unchecked pollution had inflicted on our environment. In that timeframe, as you have heard several times, we have reduced emissions of six key pollutants by 25 percent, while in fact our economy has grown by 160 percent.

While laudable, there is still more that needs to be done. Children suffer from asthma at alarmingly high rates. Many of our National Parks are shrouded in a murky haze, and our environment continues to endure damage from poor air quality, even as we have continued to vigorously enforce the Clean Air Act.

To address this situation, President Bush has proposed Clear Skies, the most significant improvement to the Clean Air Act in over a decade, and the most important emission reductions proposed by any President for the electric utility sector. Clear Skies is a powerful new tool for the next generation of air quality, building on the success of the Clean Air Act, while recognizing its original command and control methodology might not be the most efficient way to continue to improve our air. Indeed, it is important to note that Clear Skies is based on the most successful program in over a decade to address air quality, the Acid Rain Trading Program, which was created in 1990 as part of the amendments to the Clean Air Act. The Acid Rain Program had its genesis in the innovative idea that harnessing the power of the market could reap impressive environmental gains. By utilizing this pioneering cap and trade strategy, the Acid Rain Program has achieved nearly universal compliance and has cost far less to implement than traditional regulatory approaches, and has already reduced emissions levels to lower than those that were projected when the Act was passed.

Far from providing a regulatory escape for old power plants, Clear Skies is aimed directly at the previously grandfathered

plants. It would result in almost all facilities of over 300 megawatts—and many smaller ones, as well—taking action onsite, something that we have not been able to achieve under the Clean Air Act to date.

Said another way, when Clear Skies is fully implemented, 85 percent of the coal-generated power will be from facilities that will have advanced pollution control technology in both the east and the west. Clear Skies will set a uniform objective standard for mandatory reductions of 70 percent from 2000 levels of the three most dangerous air pollutants emitted by the power utility: sulfur dioxide, nitrogen oxide, and mercury.

Although it sets the goals, Clear Skies does not regulate the path to meeting those goals. This flexibility enables States and facilities to pursue the most cost-effective approach to cleaning the air, and helps ensure our ability as a Nation to respond quickly and efficiently to changes in the energy marketplace. By moving away from simple command and control toward a more market-based approach, we will remove 35 million more tons of SOx, NOx and mercury from the air over the first 10 years of the Clear Skies Act than what the current Clean Air Act would achieve in the same timeframe.

While the Clean Air Act enables EPA to regulate these three pollutants through the rulemaking process, unlike Clear Skies, there is no mandatory cap and no guarantees that emissions will reach those lower beneficial levels set by Clear Skies.

When fully implemented, Clear Skies would result in $96 billion in environmental and health benefits each year, benefits that include virtually eliminating the chronic acidity in northeastern lakes; improving visibility in our National Parks; avoiding 12,000 premature deaths; and preventing 15 million fewer days when sufferers of respiratory illnesses are unable to carry out their normal daily activities because of poor air quality, according to our analysis last year.

Clear Skies is not a change in direction, but a course adjustment. While our goal of cleaner air remains fixed, we believe that over 30 years of experience and the lessons that we have learned from addressing air pollution should be reflected as we move forward. Our environment isn't static. Our efforts to improve it shouldn't be static, either.

With or without Clear Skies, there are hundreds of counties all across America that will have to meet the Clean Air Act fine particulate and ozone standards. Either we move forward with clear legislative guidance, or face the uncertainty of regulation, rulemaking, and litigation. We believe that Clear Skies is the far preferable path.

In the President's State of the Union address, he stated that Clear Skies was one of his top domestic priorities, and I can attest to that fact. Every time that I have met with him subsequent to that, as recently as a few weeks ago, he has asked me about the status of this legislation.

With strong backing from the President, the time to enact this legislation is now. From improving our air to increasing energy security to protecting human health, Clear Skies is a clear win for the American people. In the coming months I look forward to work-

ing with you to pass this legislation and begin reaping the environmental and health benefits that it will secure.

I thank you again for the opportunity to appear, and would be happy to answer questions in the time allotted.

Senator VOINOVICH. Thank you very much for your testimony.

One of the things I would like to see if your EPA could produce would be a list of the lawsuits on both sides of the Clean Air Act, and how they have impacted on moving to improve air and public health, and utilities unwillingness to move forward with improvements to make their facilities more efficient and to provide more reasonable energy.

Administrator WHITMAN. We can certainly provide that.

Senator VOINOVICH. I think one of the issues here is that the current law has really tied us up in a cobweb of litigation that is not really making any improvement in the public health of this country or improving our air quality. We are nibbling away at it. There are critics that say that Clear Skies is not as environmentally protective as future Clean Air requirements would be, and that in fact it would roll back the Clean Air Act—as one of the Senators said, put us in a "Rip Van Winkle" environment.

It seems to me that one of the major advantages of Clear Skies is that it provides both regulatory and environmental certainty; that is, the fact that significant emissions are locked into statutory deadlines that cannot be circumvented or delayed the way that most requirements are now being delayed.

I would like you to comment on that allegation, that Clear Skies would roll back the current Clean Air Act.

Administrator WHITMAN. Well, obviously, Senator, we don't agree with that. As you stated, putting a mandatory cap on the three emissions, making it clear what is to be expected, and requiring a 70 percent reduction from 2000 levels are very significant movements forward, we believe, and great improvements to the Act.

You see there a chart that will tell you what we expect to get in emissions reductions from the Clean Air Act as it currently exists, and what we expect under Clear Skies. You will notice that in some of those columns there is—well, first of all you will notice that the numbers show a dramatic reduction, but you will also notice that there is a blank there for mercury, because we have not yet set a mercury standard. That process is in progress. We have it scheduled to be proposed before December of this year. It will be final in 2004 and become enforceable in 2007 or 2008, and that is without litigation. We know that everything we do gets litigated. One of the big benefits of having Congress act with mandatory levels is that when Congress acts, people listen, and they start to respond. When EPA acts, they go to court. And that means that we spend a lot of time in litigation, as you pointed out.

Now, we are proud of the results that we have achieved on the individual cases that we brought, but they are incremental. As you point out, Senator, it's more of a "nibbling away." By providing certainty with a cap and trade proposal with the steep 70 percent reductions that the President is calling for, Clear Skies will, as our modeling has shown, give us a 35-million-ton greater reduction in those three pollutants over the next 10 years than we can get moving forward under the Clean Air Act as it now exists. And that is

with the vigorous enforcement of New Source Review as one of the tools.

Senator VOINOVICH. Senator Carper?

Senator CARPER. Governor Whitman, as I mentioned earlier in my testimony, I mentioned that Senators Chafee and Gregg will be joining me tomorrow as we introduce our 4-pollutant bill, which is similar but not identical to legislation that some of us introduced last October, S. 3135.

My question of you is this. Has EPA conducted, to your knowledge, formal economic and environmental analysis of the legislation that we introduced last October, S. 3135?

Administrator WHITMAN. Senator, I am not sure of the status of that, but I can certainly find out for you.

Senator CARPER. If you could. If you could do that, I would appreciate it. If you would be willing to share that analysis with us, I would welcome that very much.

My other question would be, would EPA anticipate conducting an environmental and economic analysis on our new legislation that we will be submitting tomorrow, introducing tomorrow?

Administrator WHITMAN. We would be happy to work with you on that, Senator.

Senator CARPER. Those are my questions, Mr. Chairman. Thank you.

Administrator WHITMAN. Senator, I understand—looking at the time, there are a few more minutes left here, and I would be happy to do some quick answer——

Senator VOINOVICH. That would be wonderful. Thank you very much.

Senator Jeffords?

Senator JEFFORDS. At the budget hearing you said that there is a correlation between greenhouse gas emissions and global warming, from an EPA and EIA project that these emissions by power plants will grow by leaps and bounds over the course of Clear Skies. Why shouldn't this legislation guarantee real greenhouse gas reductions from this sector?

Administrator WHITMAN. Well, Senator, as you may know, this Administration has undertaken a number of different programs directed at greenhouse gases. And as you point out, it is more than just carbon; there are six of them.

First of all, as far as Clear Skies is concerned, Clear Skies is directed at improving and enhancing the progress that has already been made under the Clean Air Act, and as has already been stated, carbon is not a regulated pollutant under that act. So Clear Skies is directed at the three most egregious emissions from the power plants that we feel can be addressed now, and we want to enhance those benefits and get at them quickly in a way that makes sense for that sector.

But we have a number of programs right now that are underway. We also have as an extraordinary commitment from the Administration on research on global climate change—if we get energy bill incentives—that includes programs to encourage people to use alternate technology and to improve alternatives to the standard energy sources that we use. That means that we encourage more conservation and more renewable resources. We believe that we will

make significant progress toward the President's goal of an 18 percent reduction in greenhouse gas intensity over the next 10 years.

Senator JEFFORDS. The present law and our bill put a lot of emphasis on reducing the number of premature deaths. Is the principal purpose of Clear Skies to reduce the number of premature deaths from power plant pollution?

Administrator WHITMAN. That is certainly an enhancement of it. It is not the only reason to enact Clear Skies. We also look at the other environmental benefits that go along with it, and the reduction of other health concerns, such as asthma and bronchitis, from bad air quality.

Senator JEFFORDS. But it's not the principal purpose. All right.

According to the modeling, the agency's straw proposal would save 7,000 more lives annually than Clear Skies, and achieve $60 billion more benefits in avoided health damages per year, at an incremental cost of only $3.5 billion per year in 2020.

Why are Clear Skies's weaker requirements and slower deadlines better than the emissions reductions in the straw proposal for public health?

Administrator WHITMAN. Well, Senator, the straw proposal was just that. It was our first cut, and it was a straw. On further analysis of that straw proposal the agency determined that many of the targets there were not feasible, neither timewise nor at levels that had been projected. That was the first go-round, and as we looked at the technical capabilities that exist in reaching some of those numbers, and also looking at the economic dislocation, the impact it would have, and the overall feasibility of achieving those goals, we determined that those were not the best way to approach this.

Senator JEFFORDS. I would be willing to defer my other questions to Mr. Holmstead——

Administrator WHITMAN. You can get all the really technical answers from him. He knows what he's talking about.

[Laughter.]

Senator JEFFORDS. Thank you, Mr. Chairman.

Senator VOINOVICH. Mr. Thomas?

Senator THOMAS. Thank you, Mr. Chairman.

I am told, and your EPA modeling now confirms, that reducing mercury emissions significantly will require more than application of controls on SO_2 and NOx requirements. Instead, I understand, EPA's modeling projects that power plants will reduce mercury emissions by a significant amount by switching from sub-bituminous to bituminous coal.

If so, what kind of an impact do you think that would have on the costs and environment and economic and energy policy in the west?

Administrator WHITMAN. Senator, first of all, we do believe that in Phase 1 of the Clear Skies Act that the vast majority of the mercury goal can be attained through co-benefits. The last few tons may require something more than just a co-benefit, moret than just an enhancement of existing SOx and NOx technology, tweaking that technology a little bit further to capture more mercury with a cap than without, or maybe some other actions, but we do not believe that what will be left out there for Phase 1 is going to re-

quire a large investment from the utilities. Our modeling doesn't show that.

Without a mercury cap, I don't think there is any incentive to reduce mercury emissions. We have taken into account, as we developed Clear Skies, the difference in the type of coal—lignite coal versus other coals. We recognize that as we set at the credits that utilities get for reducing mercury, reducing emissions from the lignite coal. We believe we are reflective and balanced, understanding that we still need to achieve the goals for air quality. We recognize the different types of coal and the technology available to address the mercury in different types of coal varies, and the expense of doing that varies terrifically, as well. So we have tried to anticipate that in the legislation.

Senator THOMAS. As you know, we are also working on an energy policy, and bituminous coal is one of the longer-term resources that we have available, and it seems to me that all those things have to be taken into account.

So I hope——

Administrator WHITMAN. Clear Skies anticipates a 10 percent increase in coal as a power source overall. In the course of Clear Skies, coal use will grow in both the east and the west. It may not grow as fast in the west as it would without any kind of a mercury cap, but it will still continue to grow.

Senator THOMAS. Thank you.

Senator VOINOVICH. Senator Cornyn?

Senator CORNYN. Thank you.

Governor Whitman, you and I have discussed—my colleague was talking about bituminous coal, and I want to talk to you a little bit about lignite, which you mentioned.

I am concerned, as I know you are, about fuel diversity. Much of the electricity generated in Texas, about 40 percent, is produced by coal-fired power plants. Under Clear Skies, EPA estimates that figure will drop down to 25 percent in 2020, which is a significant decrease. This is of particular interest to me because some of the plants in Texas, of course, are using locally mined lignite coal, a practice that is a win-win situation because it creates jobs, cuts down transportation costs.

My question is this. Does EPA have any figures on whether, in Texas, the declining coal used under Clear Skies would be native lignite—that is, Texas coal—or coal that was imported from out of State?

Administrator WHITMAN. I'm sure we could get that for you, Senator. I don't know that answer off the top of my head.

Senator CORNYN. OK, if you would, please.

Just one quick follow-up, and if you would like to supply the answer to us later, that would be fine.

Does EPA have any figures on the decline in coal-mining jobs in Texas that accompanies this significant decline in percentage of coal-fired generation?

Administrator WHITMAN. Again, I don't, but in fact your next—do you have an answer to that?

OK, we both of us have to find that. I was hoping that the Assistant Administrator would be able to answer it right now. We will have to get you that.

Senator THOMAS. We'll be glad to send coal down from Wyoming, of course.

[Laughter.]

Senator CORNYN. Thank you, Mr. Chairman

Senator VOINOVICH. I thank you, Administrator Whitman. We really appreciate your being here today.

Administrator WHITMAN. Thank you very much. Thank you for this hearing, again. We appreciate it.

Senator VOINOVICH. Mr. Holmstead, do you want to sit in the warm chair?

[Laughter.]

Senator VOINOVICH. As I mentioned in my opening remarks, the threat of fuel-switching—utilities switching from coal-based generation to natural gas generation—is a major concern that must be addressed. In other words, if I look at everything that is being suggested, the one thing that I try to really pay attention to is, how far do you take us to the point where utilities say, "Chuck it, we're going to go to the use of natural gas"? And to me, that's very, very bad because that then—that cost will be passed on to all their customers, and then I believe that would have a devastating impact on our economy.

What effect will Clear Skies have on this in terms of fuel-switching? Do you think it will cause more utilities to fuel-switch?

Mr. HOLMSTEAD. This is an issue that both we and other parts of the Federal Government have looked at pretty closely, for the very reasons that you suggest. As a matter of energy policy, we think it would be a mistake to become overly dependent on natural gas, so we have looked at this issue very carefully. I know, for instance, that EIA has looked at this issue very carefully. And all of our analysis shows that even with the stringent caps in Clear Skies, that the way the industry will meet those caps is by installing control technology on coal-fired plants and not by switching to natural gas.

So we see essentially no impact on future demand for natural gas in the utility sector. I think when we compare a scenario that has us not taking any other action, the so-called "Rip Van Winkle" scenario, to Clear Skies, as far as 2020, I think the increase in natural gas usage for power generation is about 2 percent. But we all know that the "Rip Van Winkle" scenario can't be the case under the current Clean Air Act. So we think that under Clear Skies you will actually get less fuel-switching than you would get under the current Clean Air Act.

As I think you know, Mr. Chairman, one of the things that we tried to do here—and I know that Senator Carper and others are looking at the same type of issue—is to give the industry certainty and longer timeframes to plan out their investments, so that they can actually raise the capital and plan out their investments and preserve coal use. But when you have shorter time periods, which you sometimes do from the time a regulation is passed until it is implemented, it actually tends to encourage more fuel-switching than you would get under a multipollutant scenario.

So the bottom line is that by using this more efficient, more certain tool, we avoid the need for any fuel switching in the power industry.

Senator VOINOVICH. Is this philosophy of Clear Skies based on what we have had pretty much with the acid rain provisions of the Clean Air Act? I mean, there has been so much controversy about that, but it is my understanding that that has been fairly successful in moving forward and getting steady improvement.

Mr. HOLMSTEAD. Well, I think this is the best indication of its success. Wherever I go now I run into someone who claims to have invented Title IV, Acid Rain Program, which I think is an indication of how well it has worked. Back in 1990—and by the way, it was actually my idea——

[Laughter.]

Mr. HOLMSTEAD.—the Acid Rain Program was highly controversial back in 1990, and there was a lot of skepticism over whether it would prove to be effective. But President Bush, the first President Bush, made that really the centerpiece of his Clean Air Act reforms, with support from people in this room today.

What that has shown is that when you use a market-based program—and I believe I can quote Senator Carper, when he says that "markets do work"—and you give people an economic incentive to over-control and to find good ways to reduce their pollution, you can actually achieve greater gains quicker than you otherwise would.

So back in 1990, I think EPA projected that the cost of the Acid Rain Program would be somewhere in the neighborhood of $6 billion to $7 billion. The industry said it would be more than that. Now we know, 10 or 12 or 13 years later, that in fact the annual cost isn't $6 billion to $10 billion; it's more like $1 billion to $2 billion. It has substantially reduced pollution. It has done it in a way that we've never had to bring any enforcement actions because it is completely self-implementing. So I think it has really been, by everyone's measure, one of the most successful programs under the Clean Air Act. And the Clear Skies approach is really designed to build on that, simply to extend that to the two other pollutants and substantially lower the cap for SO_2.

Senator VOINOVICH. Senator Carper?

Senator CARPER. Thank you, Mr. Chairman.

Mr. Holmstead, welcome. It is good to see you again, and thank you for your testimony today and your response to my questions. Thank you for quoting me, and don't forget that first principle, too——

[Laughter.]

Senator CARPER. [continuing] . . . and as I've said now and then, you're welcome to do that.

Let me say, as I said earlier, I think we can have a 4–P rule, such as the Clean Air Planning Act that we are introducing tomorrow, and still enjoy the benefits that our domestic coal supply offers. I say that as the only native West Virginian in the U.S. Senate. An analysis that I have seen suggests that the Clean Air Planning Act would result in a similar generation fuel mix by 2020; I alluded to that during my earlier statement. But just a slightly larger shift, maybe 3 percent, to natural gas from coal, under legislation that we will be introducing, as compared to Clear Skies in 2020.

With that in mind, any idea why the President is offering a bill that does not include CO_2, while at the same time addressing SOx, NOx, and mercury?

Mr. HOLMSTEAD. I think Governor Whitman—as she said, the Administration has determined that there are really better ways of addressing the CO_2 issue and global warming in general. As you well know, CO_2 is one of six gases that is believed to contribute—possibly contribute—to global climate change. CO_2 and all of these other gases come from many different sectors of the economy, and it is really a global problem.

On the other hand, the issues that we are trying to deal with in the Clear Skies Act have to do fundamentally with the power sector. The power sector is responsible for about 65 percent of total SO_2 emissions in the United States, responsible for somewhere in the neighborhood of 25 percent of the NOx, and I think more than 25 percent of the mercury. Pollutants which are having immediate and direct health impacts. So we just think that that sort of regulatory approach is appropriate for the three pollutants, but that approach under the Clean Air Act just isn't well-suited for dealing with CO_2. As the Governor mentioned, we have a number of other programs that are proving to be successful, although some of them are only starting out, for dealing with the issue of CO_2 emissions.

Senator CARPER. Any idea what percentage of CO_2 is produced in this country by our electric utilities?

Mr. HOLMSTEAD. I know it's a significant percentage. I don't have that number at my fingertips, but we could certainly provide it to you.

Senator CARPER. I understand it's a bit more than a third.

All right. One second question, if I could. A group of companies called the "Clean Energy Group"—and I think some of them actually have representatives present in this room—I understand they ran an analysis of the legislation that Senator Chafee and I and others introduced last fall, and in that analysis they considered the cost of our bill as introduced, and then they considered our bill as if it were a 3–P bill, the same dates and levels as our bill but without any kind of carbon control. And what they found—this, to me, was amazing—they found that by adding CO_2 to the other 3 Ps they would increase the total system cost of compliance by just about 1.5 percent.

My question is this. If we can get the benefit of carbon controls for less than 2 percent in additional compliance costs—that's actually within the margin of error on most models—why is the Administration not addressing carbon?

Mr. HOLMSTEAD. I guess what I would have to say is that I haven't seen that analysis. I suppose that could be correct, although the numbers that I've seen in terms of cost for CO_2 suggest that it could be more than that. But I think the real answer is, we believe it is important to look at CO_2 in its proper context. To the extent that we need to address CO_2 and other greenhouse gases, the fact that we may make some modest reduction from one sector of the U.S. economy is probably not very relevant, and we think it would be much more efficient to focus on improvements in technology. I know, being a native of West Virginia, you must be aware of the President's proposal on FutureGen, which is $1 billion to try

to develop a power plant working with other partners a power plant that would have zero emissions of CO_2 and zero emissions of pollutants. We think it is important to focus our efforts on those sorts of things that really can resolve the issue in the longer term instead of looking at shorter-term things.

And I think my personal perspective is, I would hate to have us lose the benefits of very substantial reductions in these other pollutants that are having immediate health consequences, as we continue to take a much longer time to try to develop an elusive consensus on CO_2.

Senator CARPER. Mr. Chairman, my time has expired.

Let me just say, as I relinquish this microphone, that I find it of more than just passing interest, that we could add a fourth P to the Administration's proposal and not have a very substantial impact on the fuel mix, coal or natural gas, between what it is today and what it might be in the year 2020, and I think that's relevant to this debate.

The other thing that I described as amazing, that is surprising to me, that we can add a fourth P to a 3–P proposal, so that we are comparing apples with apples, and do so while adding less than 2 percent to the compliance cost. Those aren't my numbers; those are the numbers that were produced by a consortium of the Clean Energy Group, which includes a number of companies and utilities in this country.

Thank you again.

Senator VOINOVICH. Senator Cornyn?

Senator CORNYN. Mr. Chairman, I asked Governor Whitman about lignite. My understanding is that lignite coal is not only used significantly in Texas, but also in North Dakota, Louisiana, and Mississippi.

My concern has to do with the technology availability to reduce mercury—removal levels in lignite coal. I discussed this at the earlier budget hearing with Governor Whitman, and while I applaud her goals and optimism, I want to make sure that for Texas it doesn't represent a big gamble.

Can you tell me about any commercially available technology that is available today for mercury removal from lignite?

Mr. HOLMSTEAD. We understand that the technology known as Activated Carbon Injection, or ACI, is designed—and should be successful—in removing mercury from lignite.

Now, your question was, is that commercially available, and I think the answer to that is that it's not at this point. We don't have full-scale kinds of projects. But that's one of the reasons why we are really focused on having an overall cap as opposed to plant-by-plant kinds of requirements. One of the things that we all learned in 1990 is that as much as we may know about what we think are appropriate ways to reduce emissions, that the marketplace, left to its own devices, can find better ways of doing it. And so by having emission caps, first of 26 tons and then 15 tons, it may be that for that lignite plant it doesn't make sense to put specific controls on that, but another plant could over-control

So the real issue here is how we get to that overall cap, and so we're not as concerned about specific—what can be achieved at a specific plant.

I will say that we recognize that it seems to be more expensive to reduce mercury emissions from lignite coal, and we have tried to address that in terms of the allowances. So I think you are probably aware that we have tried to account—we would like to be able to equalize the cost of control across the different coal types, and we believe, based on what we've seen, that it can be controlled; it's just more expensive to do so. So we have taken that into account in the allowance system.

Senator CORNYN. I appreciate the fact that the bill does take into account the particular difficulty with which mercury removal from lignite is greater than other types of coal. But just to clarify, you are saying that to your knowledge there is no currently commercially available technology to remove mercury from lignite?

Mr. HOLMSTEAD. I think to be completely correct, I should say that there is a commercially available technology. To my knowledge it has not been used on a full-scale lignite plant yet. I think the vendors are telling people that they will guarantee that it can be used, but the folks that do the technology reviews believe that's the case.

But you are correct, we don't at this point have—at least as far as I know—a full-scale, full-size plant burning lignite that uses ACI technology.

Senator CORNYN. No demonstration of it——

Mr. HOLMSTEAD. I am sure my staff will correct me, which they are fond of doing, but I do think that we have some cases where we have plants burning lignite coal that have other control systems designed to reduce NOx and SOx, but also reducing mercury. So I believe that we have some evidence of that, but you are correct that there is much more uncertainty about exactly how we would get emission reductions from plants burning lignite.

Senator CORNYN. Are you referring to the North Dakota test? My staff advises me, and you can just check this out and get back to me——

Mr. HOLMSTEAD. I would be happy to.

I understand that there is a difference between the lignite in North Dakota and the lignite in——

Senator CORNYN. I just want to make sure that we're comparing apples with apples. So I would ask you to provide my staff with the test on North Dakota or any other place where you have found this to be successful, or claim to be successful, so that we can compare that to our situation in Texas.

I yield back for now.

Senator VOINOVICH. There being no other questions, you are excused, Mr. Holmstead. I know you will be available to the committee and staff as we move along to try to mark this bill up.

Mr. HOLMSTEAD. Thank you very much for the chance.

Senator CORNYN. Mr. Chairman, I just have one or two other questions I would like to submit in writing, if I may, and get responses in writing.

Senator VOINOVICH. Let the record show that Senator Cornyn will be submitting questions in writing. We are now going to ask Mr. Glenn McCullough, chairman of the TVA, to be our next witness.

Mr. McCullough, we are very pleased that you are here today to testify on behalf of Public Power. You may proceed with your testimony.

STATEMENT OF GLENN MC CULLOUGH, JR., CHAIRMAN, TENNESSEE VALLEY AUTHORITY

Mr. MCCULLOUGH. Thank you, Mr. Chairman, and members of the Subcommittee.

On behalf of the TVA Board and our employees, thank you for the opportunity to discuss our views on clean air and more specifically, the Clear Skies Act of 2003. As both steward of the environment and provider of electricity in the Tennessee Valley, TVA has a unique perspective on the clean air issues facing our region and the Nation. Each day TVA works to find the best balance for providing affordable reliable electricity to fuel a sustainable and vibrant economy and enhancing environmental quality.

No aspect of that balance is of greater importance than the issue you are considering today—clean air. Through 158 local utilities and 62 large industrial customers, TVA supplies electricity for 8.3 million people across a seven–State region. The President's national energy policy recognizes the importance of a diverse generating mix for our Nation.

TVA's power system reflect such diversity. The diversity of our system requires a comprehensive commitment to environmental stewardship. That commitment is reflected by a record of emissions reductions. Since 1977, TVA has reduced sulfur dioxide emissions by 76 percent. We plan to invest an additional $1.5 billion to build an additional five scrubber systems. This action, along with switching to low sulfur coal, will reduce SO_2 emissions 85 percent from 1977 levels and when completed will result in scrubbers on more than half of our capacity.

In the past 8 years TVA has reduced nitrogen oxide emissions by 50 percent, and in the future we are investing more than $1.1 billion to install selective catalytic reduction systems or similar technologies on 25 generating units. In combination with other controls, the SERs will reduce our NOx emissions by 75 percent during the ozone season.

By 2005, we will have SERs on more than 60 percent of our coal-fired capacity. So far TVA has invested more than $3 billion for clean air improvements, and by 2010 we will have invested nearly $5.6 billion.

As I outlined, we are in the midst of one of the most aggressive emission reduction programs in the Nation which means that between now and the end of decade, TVA will spend an average of nearly $1 million a day to improve air quality. We know that emissions from all sources—stationery and mobile—must continue to be reduced.

For that reason, Mr. Chairman, I am here today to endorse the Clear Skies Act of 2003. While the current Clean Air Act has done much to improve air quality, it contains provisions that could threaten reliability and affordability of the Nation's electricity supply. Affordable, reliable electricity is achieved, in part, by the industry's ability to use a diverse number of fuel sources including coal, our Nation's most abundant energy source.

The Tennessee Valley depends on coal for about 60 percent of our electricity. Unfortunately, this vital energy resource currently faces a complicated web of overlapping, duplicative, and unnecessarily costly emission control requirements to create enormous uncertainty for future investment.

For example, there are more than a dozen separate regulations for sulfur dioxide and nitrogen oxides alone. At times disputes over these regulations have significantly delayed the improvement of air quality they were designed to achieve. This piecemeal approach should be replaced with a set of timetables and reduction targets for sulfur dioxide, nitrogen oxide, and mercury.

We believe that Clear Skies, a well-designed multi-emission approach, will continue the national trend of better air quality and provide additional benefits. Those benefits include a streamlined regulatory process; sustained diversity in the Nation's fuel supply; and market-based mechanisms for achieving reductions that are fair. They are fair to both public and private power providers.

Clear Skies would give the utility industry the certainty it needs to plan and to finance emission reductions without unduly driving up prices for consumers. Such results have been demonstrated by the very successful Acid Rain Program, as has been referenced to today.

While TVA endorses the reduction targets and timetables in Clear Skies, some provisions could be addressed to achieve the same environmental benefit and be less burdensome to coal-fired generations. Specifically, we urge you to ensure that the interim 2010 mercury targets reflect the Administration's intent of reducing mercury to levels achievable via a cap-and-trade system through the co-benefits provided by sulfur and nitrogen control technologies. This would allow utilities that have already reduced mercury through sulfur and nitrogen technologies to realize credit for previous action.

In conclusion, Clear Skies is a very aggressive proposal. Unlike those advocating for more stringent targets and timetables, TVA uniquely knows what is required to achieve reductions such as those called for in Clear Skies. As I mentioned earlier, TVA will have invested $5.6 billion in emission reductions by the end of this decade. Achieving the results contemplated by Clear Skies would require TVA to invest an additional $4 billion between now and 2018.

To achieve more on a faster timetable would increase costs considerably and place an unrealistic burden on both the consumer and the economy for little additional environmental benefit. The TVA appreciates the Subcommittee's valuable work in shaping a balanced, achievable path to cleaner air for our Nation.

Thank you. I will be happy to respond to any questions you may have.

I would ask that my written statement be placed in the record in its entirety.

Senator VOINOVICH. Mr. McCullough, are you familiar at all with the bill that was marked up by this committee last year, the Jeffords–Lieberman bill?

Mr. MCCULLOUGH. I have not researched that bill, Senator.

Senator VOINOVICH. One of the provisions that is contained in the bill deals with the issue of greenhouse gases, CO_2. There has been some debate on whether or not CO_2 ought to be included in Clear Skies. Preliminary to that, I have been doing what I can, working with Senator Carper and some other people to see if we cannot find some kind of a compromise that will deal with the issue of greenhouse gases.

Mr. MCCULLOUGH. Yes, sir.

Senator VOINOVICH. The question is: If we cap CO_2, what impact would that have on TVA?

Mr. MCCULLOUGH. Mr. Chairman, I would have to know what the cap might be. We believe that the President's proposal to voluntarily reduce greenhouse gases is responsible, and is one that has worked. TVA, over the last decade, has reduced our greenhouse gas emission by over 200 million tons. We have done that by introducing renewables, by biomass, co-firing our coal units, and by other technologies.

We believe that the Administration's proposal to voluntarily call for a reduction in greenhouse gases at this point in time with the level of technology still advancing in terms of greenhouse gas sequestration and containment, is a responsible way to proceed.

Senator VOINOVICH. I would like you to run the numbers on the bill last year. There will be a number in the bill that I am sure Senator Carper introduces. I would just like to get your honest opinion about what impact it would have on your operation.

What impact do you think that Clear Skies would have on your ability to maintain your diverse fuel mix? You have 60 percent coal. What is the rest of it?

Mr. MCCULLOUGH. Mr. Chairman, that is right. TVA's generation mix is about 60 percent goal. Clear Skies is very ambitious and very aggressive. Control will be required to achieve the reductions in nitrogen oxide and sulfur dioxide that Clear Skies calls for. It provides a 15-year period of time so that utilities can prepare to meet these reductions in a way that is responsible for the consumer.

At the same time, we can continue to rely on what is about a 300-year most abundant supply of fuel that this Nation has. We can continue to implement clean coal technologies that are reducing in a really significant way the NOx and sulfur emissions. We feel that we can continue to add to the diversity in the strength and not reliance of any one single fuel mix of renewals, the expansion of safe nuclear, and hydroelectric. We believe that all of these diverse generation mixes are the key to having energy security and achieving additional reductions in emissions.

Senator VOINOVICH. Thank you.

Senator Carper?

Senator CARPER. Welcome, McCullough. We are delighted to have you before us today.

I understand you may have a common bond with our chairman. Have you ever been an elected official?

Mr. MCCULLOUGH. Yes, sir.

Senator CARPER. What position did you hold?

Mr. MCCULLOUGH. Senator, I was elected mayor of Tupelo, Mississippi.

Senator CARPER. Are there any famous people who ever born in Tupelo?

[Laughter.]

Mr. MCCULLOUGH. Elvis Presley might come to mind.

Senator VOINOVICH. Thank you, very much.

[Laughter.]

Senator CARPER. He does a great Elvis impersonation. He just gave us a little piece of it here. This is the guy who started the Rock and Roll Hall of Fame when he was Mayor of Cleveland.

Senator VOINOVICH. Absolutely.

Senator CARPER. You guys may want to get together and jam later.

[Laughter.]

Senator CARPER. I want to follow up on a question of a response that was going back and forth between you and our chairman. The question I think he was asking was the effect on TVA of the enactment of legislation that addresses CO_2, that addresses carbon. You indicated, understandable, that you would have to know what the caps were before you would be able to give some indication of how you and the folks of TVA would be able to respond and comply.

The legislation introduced by our colleague, Jim Jeffords, who has already gone, if I am not mistaken, his legislation says that by 2008, we should have reduced emissions of CO_2, of carbon, so that the levels are back to those that existed in 1990.

The proposals that I and some others will introduce tomorrow have two goals: an interim goal and then a longer-term goal. By 2009, we would expect the industry to have levels of emissions no greater than what existed in 2005.

Further, by 2013, we would expect those levels of emissions to have been reduced to have existed in 2001. So in 2009 we want to be back down to 2005 levels, and in 2013 we want to be back down to 2001 levels.

If you could give us some initial reaction to that, I would welcome it. You have an array of proposals here from Senators Jeffords' very aggressive approach, to the Administration which chooses not to include carbon in their proposal, to what I have outlined, the stair step approach.

What are your thoughts?

Mr. MCCULLOUGH. Senator, and Mr. chairman, I will get the analysis run. We will certain respond in more detail as to how that could affect TVA's system.

We believe that a reduction in greenhouse gases to an 18 percent intensity of the U.S. economy by 2012 is responsible and very ambitious, and yet an achievable greenhouse gas strategy.

I will be happy to take a look at the caps that are called for and do the analysis on our system and get that information to you in more detail.

Senator CARPER. You mentioned the 18 percent reduction. I think Governor Whitman may have alluded to that as well in her own testimony.

My understanding is that it is not an outright 18 percent reduction, but it is an 18 percent slower growth in the level of emissions.

Mr. MCCULLOUGH. It is my understanding that in 2012, we would have a greenhouse gas intensity that would not exceed 18

percent of the economic activity. The is a range, a ratio, that you can measure there.

Senator CARPER. We will have an opportunity to double check that. I will double check it and perhaps you could as well. But my understanding is that the 18 percent reduction is not a reduction overall, but it is a reduction of 18 percent in the growth.

I see some members of the audience nodding their heads. So I am thinking maybe there is something to that.

Mr. MCCULLOUGH. Yes, sir.

Senator CARPER. This is more of a personal question, but we are among friends. Just talk to me about your own personal commitment and views on clean air. You have an obligation to the folks who work for you and your customers. Talk to me about your obligations that you feel to the people who may live in the areas that you serve and the rest of us who live downwind. Talk to us about SOx and NOx and CO_2 from your heart.

Mr. MCCULLOUGH. Thank you for the question, Senator. TVA does have an intense responsibility to ensuring that our air is cleaner. As I said, we have invested over $3 billion to date to bring down NOx and sulfur dioxide emissions significantly. By 2005, TVA will reduce nitrogen oxide emissions by 75 percent.

Senator CARPER. By when?

Mr. MCCULLOUGH. By 2005.

Senator CARPER. Compared to what?

Mr. MCCULLOUGH. Going back to 1997 levels when we started this ambitious selected catalytic reduction system strategy. By the same year in 2005, we are going to reduce carbon dioxide emissions by 85 percent through the employment scrubbers.

Now, going forward, if Clear Skies were implemented, we would have to install SERs on 23 additional units at a cost of another $5 billion by 2018.

Senator CARPER. You said $5 billion by 2018?

Mr. MCCULLOUGH. Yes, sir.

Senator CARPER. Give me some idea of what your revenues are in a year? Do you have any idea what your revenues were last year?

Mr. MCCULLOUGH. Yes, sir. Our revenues in fiscal year 2002 were $6.8 billion.

Senator CARPER. So, looking at between now and 2018, we are talking about revenues probably close to $200 billion?

Mr. MCCULLOUGH. Our revenues are growing at 2 to 3 percent per year. I would have to project that out for you.

Senator CARPER. I was just trying to get an understanding of what percent of your revenues a $5 billion is suggesting. It sounds like it is about 2 or 3 percent.

Mr. MCCULLOUGH. We are spending $527 million in this fiscal year alone on clean air. That is on a $7 billion budget. We are projecting to reduce SOx emissions by 85 percent by 2005. Again, we would have to control 40 additional generation units if Clear Skies were enacted by the year 2018. This is very aggressive.

Senator CARPER. Just out of curiosity. How do you fund those investments? How much did you say this year?

Mr. MCCULLOUGH. $527 million.

Senator CARPER. How do you fund that?

Mr. MCCULLOUGH. Although we are owned by the Federal Government, TVA is totally self-financed. We do not rely on any appropriated dollars. So all of the funding for clean air, for a higher quality of water, for power generation, and transmission upgrades to run our system and to reduce our debt, comes from the ratepayers of the Tennessee Valley.

Senator CARPER. Do you issue debt?

Mr. MCCULLOUGH. Yes, we do issue bonded indebtedness.

Senator CARPER. Will you issue debt in part to pay for those kind of investments?

Mr. MCCULLOUGH. Yes, this Board is committed to continuing to bring our debt down.

Senator CARPER. To quote a native son of Tupelo, "Thank you very much."

[Laughter.]

Mr. MCCULLOUGH. You are welcome, very much.

Senator VOINOVICH. Are you familiar with the Jeffords–Lieberman numbers for the 3–Ps—NOx, SOx, and mercury?

Mr. MCCULLOUGH. No, sir; I am not.

Senator VOINOVICH. I would like to get your reaction to what those numbers would do if that legislation had passed. The real issue is whether or not it would have caused you to fuel switch?

Mr. MCCULLOUGH. Mr. Chairman, we would like to do that analysis in detail and report back to you.

Senator VOINOVICH. Have you ever calculated what impact fuel switching to most probably natural gas would have on your customers?

Mr. MCCULLOUGH. It would result in an increase in cost due to the volatility in the price of natural gas. We do rely on natural gas for peaking capacity, but primarily our system, as I stated, is close to 60 percent coal. We are about 25 percent nuclear. We are uprating our nuclear units bringing on line the first reactor in the 21st century at Browns Ferry. We are modernizing our turbines in 29 of our hydroelectric facilities. We are doing renewables. We are doing solar, wind, and land fill gas. We rely on natural gas for peaking capacity.

Senator VOINOVICH. Thank you.

Senator Carper, do you have anything else?

Senator CARPER. I have just one last quick question.

We had a hearing last week with the Department of Defense. We were talking about their interest in being "excused" from strict compliance with some of our environmental laws when it comes to cleaning their environmental hazards and waste sites.

One of the points that we made to the Department of Defense is that while we are not interested in doing anything that curtails the readiness and their ability to defend our security at home and our interests abroad, we felt that because they are a government agency, they had a special obligation to be good stewards of our environment. Your authority is not exactly a government entity but created by the government and has a special standing and I think maybe a special responsibility.

I was pleased to hear of your interest in looking to renewables—wind, solar, and others—as you provide power to your customers.

I would also ask you just keep in mind the special standing that you have and the special responsibility that you have with respect to our environment and our clean air. I think you have that. I just want to reinforce that today.

Mr. MCCULLOUGH. Thank you, Senator. We definitely concur with that point. I can assure you that we take that responsibility very seriously.

Senator CARPER. The last question I would ask is: People sometime say to you, "What do you want to do next in your life?" I always tell them, "I would like to move to a little city—not Cleveland. Just a little city and maybe be their mayor."

What is it like being mayor of Tupelo?

Mr. MCCULLOUGH. It is a wonderful opportunity.

Senator CARPER. My home town is a wonderful city. That was a great opportunity. The opportunity to serve at TVA is likewise. I was with three mayors from Alabama earlier this morning. It is a great accountability to be held accountable and to have this opportunity to hear your thoughts and to respond.

Thank you, Mr. McCullough.

Senator VOINOVICH. Thank you for joining us.

Mr. MCCULLOUGH. My pleasure.

Senator VOINOVICH. The first witness of our next panel will be Mr. Jim Rogers, CEO and President, Cinergy Corporation. Mr. Rogers is going to be here on behalf of the Edison Electric Institute which represents the major utility companies in the United States. This is an Ohio-based utility, Cinergy Corporation.

Mr. Rogers is not only representing them but he is also representing the Edison Electric Institute.

He will be followed by Ken Colburn of the Northeast States for coordinated Air Use Management; David Hawkins, Climate Center Program Director, Natural Resources Defense Council; Eugene Trisko, United Mine Workers of America; and Bernard Melewski, Adirondack Council.

Mr. Rogers, we are very happy to have you here today with us. Thank you.

STATEMENT OF JAMES ROGERS, CEO AND PRESIDENT, CINERGY CORPORATION, ON BEHALF OF THE EDISON ELECTRIC INSTITUTE

Mr. ROGERS. Thank you, Mr. Chairman. I appreciate the opportunity to be here today. I want to start by thanking you personally for your leadership on this Subcommittee and driving these important issues forward because it is critical to entire economy to get it right.

As you said in your opening statement, it is really all about harmonizing our energy, environmental, and economic goals in this country. I have every hope that with your leadership we will get that done.

While it is your job to harmonize, my job is to translate our country's goals and policies into kilowatt hours delivered into the homes and businesses of Ohio, Indiana, and Kentucky. I take my stewardship in a very serious way. That is why I have been for many years a supporter of multi-emission legislation that has ultimately been embodied in the Clear Skies proposal.

My job is to purchase fuel. We purchase almost $800 million a year, or 30 million tons of coal to purchase gas, to build power plants, to build scrubbers and SERs to reduce emissions, to invest in new technologies.

Senator Carper, this really goes to your question about stewardship, we spent $950 million to reduce emissions. On NOx, we spent on $800 million, which is significantly more than many projected that it would be because of the compressed time lines that occurred. With respect to Clear Skies, we are going to spend roughly $1.5 billion.

My job is to make sure this impact on our customers, our investors, and our communities is done in a way that creates a value for all of them. My testimony lays out all of the specific issues. It urges you to go to work. I am prepared to go to work and to spend the $1.5 billion to make further emissions reductions.

I do not think that there is any question that the Clean Air Act is broken. I think everybody that is sitting here could support that. Just look at the proposals—whether it is Senator Jeffords' proposal, or whether it is your proposal, Senator Carper, or whether it is Clear Skies—everybody is pointing to the fact that it needs to get fixed. There needs to be a sense of urgency about getting it fixed. I do not think anybody disagrees with that.

I think the other thing is we need to reach agreement. Every day we delay, every day we are in court litigating the Clean Air amendments in the Clean Air Act, is a day delayed in reducing emissions. I urge you to have a robust debate, but not an endless debate. Again, every day you debate is one less day we have to reduce emissions.

The important issues are to maintain coal's position in the mix. This is a diversity of fuel issue. We have to get that right. We have to keep coal in the mix. Under the current Clean Air Act, we are going to become increasingly dependent on gas. In my judgment that is not a good thing for this country.

In the last 3 years we have built 10 years of generating capacity in this country, all gas-fired. No time in the history of our country have we built so much generation predicated on one fuel. What I worry about is where the gas is going to come from? Is it going to be new L&G terminals with all the environmental issues there and the importation and further dependency on the Middle East? Is the gas going to come from wilderness areas? Is it going to come from offshore? Is it going to come from Alaska?

These are the questions we need to ask. We have not answered those questions in an affirmative way that really allows the gas supply to be there. Just this winter in Ohio three still plants were shut down because gas prices went so high. Heating is a very critical factor to make sure we have adequate heating.

I would urge you to remember back to 1978 when this Congress passed the law banning the burning of natural gas to generate electricity. It was repealed 6 years later, but the fact of the matter is that we think of gas as a premium fuel. If we go back to that way of thinking again and looking at the supply/demand balance, we may well. If we go back to that way of thinking again, where do we turn to meet the demand for electricity in this country. The place we turn is to coal where we are so dependent today.

My recommendation to you is to go to work, get it done, give us the ability to go to work and continue to reduce emissions in the future.

Thank you very much.

I would ask that my written statement be placed in the record in its entirety.

Senator VOINOVICH. Thank you.

Our next witness will be Ken Colburn, Executive Director, Northeast States for Coordinated Air Use Management.

We are glad to have you here today.

STATEMENT OF KEN COLBURN, EXECUTIVE DIRECTOR, NORTHEAST STATES FOR COORDINATED AIR USE MANAGEMENT

Mr. COLBURN. Thank you, Mr. Chairman. My name is Ken Colburn. I am Executive Director of NESCAUM, an association of air quality agencies of the eight Northeast States. I am pleased to fill in for New Jersey Department of Environmental Protection Commissioner, Bradley Campbell, who had to leave for some appointments with Members of Congress.

The Northeast States strongly support an integrated multi-pollutant approach to reducing power plant emissions, and have so testified before you in the past. We applaud the Administration and the committee for making such legislation a priority in this Congress.

In the Northeast, where sulfur dioxide and nitrogen oxide emissions from upwind power plants contribute significantly to fine particle and ozone pollution, acid rain, and poor visibility in our wilderness areas, we have long appreciated the need for Federal action.

Mercury contamination had led to fish consumption advisories on our lakes and rivers, creating an urgent need to curb the buildup of this persistent neurotoxin in our environment. We see the problem of climate change as presenting unprecedented challenges for our ecosystems and quality of life, but also great economic opportunity for those who develop the clean energy technologies of the future.

For these reasons, the Northeast States have followed with keen interest the multi-pollutant initiatives now before Congress, including the Administration's "Clear Skies" proposal. In evaluating each, we have asked three core questions:

Is it comprehensive? Does it adequately address public health and the environmental challenges we face? Does it ensure continued clean air progress, not only at the national level, but at the local, State, and regional levels as well.

Recognizing Clear Skies as a starting point for the committee's deliberations, I want to focus my remarks today on how Clear Skies can be improved to meet these tests.

First, emission reductions can and should happen sooner. Many areas of the country need to attain new, more stringent standards for ozone and fine particles in the next four to 7 years. Yet, the emissions caps in Clear Skies will not be fully implemented until 2018. Delaying these cuts for another 15 years is a problem for

States trying to reach attainment, but it is an even bigger problem for individuals experiencing serious health concerns.

Second, we can and should do more to reduce mercury emissions. Given the availability of highly effective control technologies, and the bioaccumulative threat posed by this toxin, we should not depend only on co-benefits from other controls. Mercury emissions should be capped at a level around half what Clear Skies proposes.

Third, national multi-pollutant legislation must address the intractable problem of transported air pollution, and must not weaken or remove the regulatory tools that States rely on to improve air quality at the local and State levels. There is no guarantee that regional transport concerns will be solved under Clear Skies. Yet, States would be unable to secure Federal help in addressing transport until after 2012. Even then, new hurdles for Federal intervention could make the current transport provisions of the Clean Air Act essentially unenforceable.

States support constructive reform of the Clean Air Act provided it advances clean air objectives and is strictly tied to implementation of new reduction requirements. Clear Skies appears to go too far in the direction of regulatory reform, however, weakening or even eliminating several provisions of the Clean Air Act before its caps even take effect. Several such concerns including New Source Review, regulation of non-mercury toxins, potential local impacts, and protection of States' rights are listed in an attachment to my testimony.

The bottom line is that it is better for States to have too many tools and not need to use them than to have States in a Catch–22 position with the responsibility for reaching attainment, but without the tools to do so.

The final issue I want to address is carbon dioxide. It belongs in multi-pollutant legislation because without it, the market signals and business certainty needed to promote sound investment decisions will remain absent. The result will be greater climate risk and higher costs for both the industry and consumers. The Northeast States feel so strongly about the need to act on climate change that they have made State level commitments to reduce greenhouse gas emissions. Some have included carbon in their own aggressive 4–P initiatives. Regulation of carbon does not need to be onerous, but carbon does need to be "in."

In short, we support multi-pollutant legislation that does both more and less than Clear Skies proposes, more (and sooner) in terms of pollution reductions, and less in terms of altering the Clean Air Act.

Earlier, the EPA Straw Proposal was mentioned. We urge the committee to revisit EPA's Straw Proposal and other current legislative initiatives to see about capturing the additional benefits I have already enumerated.

In closing, let me thank you for considering our views. Again, we commend the Administration for keeping multi-pollutant legislation on its legislative agenda. The Northeast States believe that the opportunity for real progress here is as great as the need for it. We look forward to playing a constructive role in this effort.

Thank you, Mr. Chairman.

I would ask that my written statement be placed in the record in its entirety.

Senator VOINOVICH. Thank you.

Mr. Hawkins?

STATEMENT OF DAVID G. HAWKINS, CLIMATE CENTER PROGRAM DIRECTOR, NATURAL RESOURCES DEFENSE COUNCIL

Mr. HAWKINS. Thank you, Mr. Chairman.

I would request that my full statement be placed in the record in its entirety.

On behalf of the National Resources Defense Council, I will try to highlight the three major policy failings in the Administration proposal. They are: The proposal fails to protect public health; it repeals or weakens key safeguards in existing law, and that by ignoring carbon dioxide it worsens global warming.

On the first point, public health, the evidence is undisputed that power plant pollution contributes to some 30,000 premature deaths a year in the United States along with other damages. The first question you should ask about any proposal before us: How good a job does it do in reducing that toll of public health damage?

The first chart to your right shows that the Administration proposal does not do an adequate job. It fails to protect public health, especially when compared to proposals that were sent into the Administration but never came out of the Administration. I refer to what was called the "Straw Proposal" of EPA.

That was the label on the document. The analyses were not straw analyses. They used the same peer-reviewed methods as the Administration's proposal, but analyzed a tighter cap. Governor Whitman testified that those proposals did not go forward because they were determined to be infeasible.

If EPA determined them to be infeasible, it has not published the results of that conclusion. Indeed, the only analysis on the Agency's website and the only analysis we have seen publicly shows the opposite—that it is feasible, that you can achieve these reductions faster.

I urge the committee to ask these kinds of questions: Is there an analysis that shows that the better program is infeasible? If so, this committee should see it, especially before voting on something that has the results which I will display on the next slide.

Compared to the proposal it rejected, the Administration's bill saves $3 billion for the industry, but at a cost of $60 billion in public health damage to the American public. That is an incredibly bad bargain. Before you vote for it, I would hope you would want full answers to why that is a justifiable outcome.

These damages do not just occur in 2020, but in fact, they occur all the way along between now and 2020 as a result of the higher emissions allowed by the Administration proposal, compared to the EPA proposal that they rejected. This second chart shows that all along the way that the emissions from the Administration proposal are significantly higher than the emissions under the EPA proposal. Again, a discussion of why this better proposal was rejected is what is critical here.

When you look at the pollutant mercury, you see again dramatically higher loadings. This is a snap shot in 2015 of the mercury

loadings under the Administration's bill compared to the EPA proposal which was rejected. As you can see, the mercury emission loadings are much higher around the country. I want to draw your attention both to the Great Lakes Regions, to the Adirondacks regions, as well as to the Mid–Atlantic Regions. These are all dramatically higher mercury loadings.

That mercury, once released to the environment, will stay there for decades, if not hundreds of years. That is a commitment not just for this generation, but for future generations.

The next slide illustrates the weakening changes to current law. The testimony before you, especially from Governor Whitman, indicated that it would be better to get these pollution reductions through a cap. Well, it is a false choice to say that you have to weaken the current law in order to have a cap.

The first President Bush did not do that. A cap was adopted by this Congress for sulfur dioxide in 1990. It has produced economic benefits. It has produced efficiencies. Not one word of the existing law was weakened or repealed as a result. You do not need to do it in this legislation, either.

Finally, since my time is almost at an end, I just want to say a few words about global warming. This is a problem that will not get easier by ignoring it. The investments made to comply with a multi-pollutant bill will be long-term capital investments. We need to do something about this problem of global warming in making those investments. For business certainty we need to do something about this problem to preserve the option of stabilizing global warming.

Carbon dioxide emissions from the electric sector are 40 percent of U.S. CO_2. They have gone up by 26 percent since 1990. That is three times the rate of the increase in the rest of the economy. They will go up by another 38 percent between now and 2025, according to the base case analyses. If we do not do something about this, we will dig ourselves a deeper hole. We can do something, and we should.

Thank you very much.

Senator CARPER. Thank you very much.

Mr. Trisko, welcome.

STATEMENT OF EUGENE TRISKO, UNITED MINE WORKERS OF AMERICA

Mr. TRISKO. Thank you, Senator. It is my pleasure.

I am Eugene Trisko. I am an attorney here representing the United Mine Workers of America. The UMWA is the labor union that represents the Nation's organized coal miners. The Union supports additional reductions in SO_2, nitrogen oxide, and mercury from coal-fired power plants provided that the reductions are achieved in a manner that preserves coal miners jobs.

The Union supports the emission tonnage reduction targets in the Clear Skies Act and has only a couple of suggested changes to the bill. We further believe that the time to act on this legislation is now.

Since 1990, the UMWA has lost thousands of coal mining jobs as a consequence of fuel switching in response to the acid rain provi-

sions of Title IV. The Union is very sensitive to the risks of additional job losses through new clean air legislation.

For this reason, the UMWA appreciates the concerns that the Administration has expressed toward its interest in the development of the Clear Skies Act, including the provision of incentives to encourage the early installation of control technologies.

The UMWA became active in the Clear Skies process in August 2001 in response to the release of EPA's initial "Straw Man." The UMWA believes that a single phase approach to reducing SO_2 emissions can be developed in a manner that reduces the risk of fuel switching by encouraging the use of available emission control technologies, thereby maximizing the co-benefits of mercury reductions.

The United Mine Workers respectfully request the committee to consider limiting Eastern SO_2 reductions to a control program with a three million ton cap and a reasonable final deadline, perhaps similar to the 10-year deadline provided by the Title IV Acid Rain Program. This will provide larger emission reductions in time to assist States in attaining the new $PM_{2.5}$ standard.

The Mine Workers agree that differentiating NOx control requires between Eastern and Western States makes sense in light of OTAG modeling results showing the miner contribution of Western NOx emissions to ozone affecting Eastern States.

The Union also supports the mercury tonnage targets and timetables in Clear Skies. This approach will provide time for new mercury control technologies to be developed and commercially demonstrated.

On the other hand, the Mine Workers urge elimination of the emission auction provisions of the Clear Skies Act. Requiring sources both to reduce emissions and to pay for auctioned allowances is a form of double taxation. Over time this new energy tax would create major disincentives to the use of coal reserves in eastern States producing higher sulfur coals.

The Mine Workers are concerned that efforts to craft new clean air legislation should remain focused as the Clear Skies Act is on reducing the air pollutants contributing to domestic air quality problems.

Regulating global concentrations of greenhouse gases under the Clean Air Act is not feasible. Carbon dioxide, the principle greenhouse gas, is not harmful to human health, and could not properly be classified as a criteria air pollutant. Global greenhouse gas concentrations are projected to increase into the foreseeable future, driven by the economic growth of developing nations exempt from the Kyoto protocol.

Moving forward on climate change requires a truly global agreement on greenhouse gases that recognizes the common but differentiated responsibilities of parties to the Rio Treaty with an equitable apportionment of emission limitation targets among all parties.

Mr. Chairman, on October 24, 2001, the presidents of seven labor unions conveyed their views on this issue to this committee. A copy of their letter is attached to my full statement.

Finally, we need to recognize that State utility restructuring efforts and other economic forces have degraded the financial health

of the electric utility industry. The industry is littered with companies in or teetering on the edge of bankruptcy. Under these circumstances, UMWA recommends that the committee consult with the congressional Research Service or the General Accounting Office on the financial implications of the Clear Skies Act and other proposed emission controlled legislation.

Both the tonnage reductions and timetables for compliance should reflect sound financial and economic assumptions about the ability of the industry to comply.

Thank you.

I would request that my full statement be placed in the record in its entirety.

Senator CARPER. Thank you very much, Mr. Trisko.

Mr. MELEWSKI. Welcome.

STATEMENT OF BERNARD MELEWSKI, ADIRONDACK COUNCIL

Mr. MELEWSKI. Thank you. Good afternoon. My name is Bernard Melewski. I am the Counsel and Deputy Director of the Adirondack Council. I would like to thank the committee for this opportunity to be with you today.

The Adirondack Council is a private not-for-profit organization dedicated to enhancing the natural and human communities of the Adirondack Park in New York State. The six-million acre Adirondack Park is the largest park of any kind in the contiguous Untied States. It is nearly three times the size of Yellowstone National Park, and almost half the Adirondack Park is publicly owned and protected as forever wild by the New York State Constitution since 1895.

Due to its location and its thin soils, the Adirondack Park has suffered the worst environmental damage from acid rain in America. Prevailing winds carry power plant emissions from outside New York's borders into the Adirondack Mountains where they fall as acid precipitation. The acidity alters soil chemistry, inhibits plant growth, and releases heavy metals that are toxic to plants, animals, and fish. Reports conducted by a host of Federal agencies have shown that more than 500 of the Park's 2,800 lakes and ponds have become too acidic to support their native life.

Each spring our waters suffer acidic shock for weeks as the winter's nitrogen loaded snow pack melts. The Park's high elevation spruce and fir trees and its spectacular maples are disappearing at an alarming rate. Every report issued in the past 10 years reflects these observations and worse and predicts continuing damage if more is not done to control power plant emissions.

In 1998 the Adirondack Council was invited by this committee to testify about S. 172, the Acid Rain Control Act, legislation then proposed by the late Senator Patrick Moynihan. We said in 1998 that any new legislation that seeks to bring an end to the acid rain problem should, at a minimum, contain two provisions. The same holds true today.

First, build on the successful sulfur dioxide cap-and-trade program by creating a third phase of reductions of 50 percent or more. Second, create a new year-around cap-and-trade program for nitrogen oxides that reduces emissions by 70 percent or more.

The Clear Skies Act meets and exceeds those emissions targets. The Clear Skies Act embraces the reductions in the Moynihan proposal and then goes further with an additional phase of cuts. The emission caps in the Clear Skies Act will set the course for recovery of the Adirondacks.

Three years ago when the Adirondack Council last testified before this committee, Senator Voinovich observed that New York had to show that we were willing to do what were asking of the States upwind. Well, Senator, it is done, and we are back.

Last week the Pataki Administration in New York adopted the toughest acid rain regulations in the country despite the fact that more than 80 percent of our acid deposition problem originates outside our borders. We are doing what we can but we need Congress' help.

New York is part of the EPA brokered 22–State State Implementation Plan that will reduce nitrogen emissions significantly during the summer ozone season in 2004. The SIP call is only a summer seasonal program and will not address in a significant way the total loading of nitrogen to sensitive areas. New York will require its power plants to implement year-around controls immediately under the new regulations.

The Clear Skies Act does not impose those year-around controls until 2008. The Council requests that the committee take a look at whether imposition of year-around control controls could be advanced.

In the markup of Senator Jeffords' bill last session, Senator Clinton offered an amendment which was adopted by this committee. The amendment would ensure that the benefits anticipated by new emission caps were, in fact, occurring in sensitive areas. If not, the Administrator would have the authority to reduce emissions from contributing sources to reduce acid deposition to tolerable levels. We appreciate that Senator Jeffords has retained the provision in the reintroduction of his bill this session. We would appreciate this consideration by the committee.

We would also request that the committee examine whether there can be faster timetables, especially in the out-years for the second phases of SOx and NOx reductions in Clear Skies. Every year that can be gained and every ton that can be saved will hasten the biological recovery of our forest, our streams, and our coastal estuaries and will save thousands of lives.

Last spring President George W. Bush visited the Adirondack Park on Earth Day. He said that he was committed to solving the acid rain problem. The President chose the occasion of the State of the Union message to renew that commitment to call for action this year. The introduction by the leadership of this committee of the Clear Skies Act is an important step forward.

I want to extend on behalf of the Board of Directors of the Adirondack Council an invitation to all of members of this committee to visit the Adirondack Park and see what a wonderful resource you will save. Perhaps you will have the good future to hear the haunting call of the loon in the Adirondack Wilderness and know that the same experience has been preserved for future generations by the actions you take this year.

Mr. Chairman, the Senate committed itself to the task of ending the destruction of acid rain over a decade ago. We think it is time to finish the job.

Thank you again.

I would request that my full statement be placed in the record in its entirety.

Senator VOINOVICH. Thank you very much.

Mr. Melewski, I am sorry I was not here to hear all of your testimony. But you mentioned in the testimony the adoption of the caps proposed for sulfur dioxide and nitrogen oxide in Clear Skies will set the course for recovery of the Adirondacks and the many other acid rain ravaged sections of the country.

If you mentioned this, I apologize. I know we have had some dialog with your organization last year in terms of the issue of greenhouse gases. You indicated that you were in favor of moving forward on these three because you felt that it was time for something to be done.

Would you comment on your frustration over the last couple of years with the lack of real movement in terms of making any difference for your part of the country and why you feel that not including greenhouse gases is something that you feel comfortable with?

Mr. MELEWSKI. Well, Senator, if it were just the last couple of years, we would be happy. It has actually been over a 10-year period. As you know, our organization joined with New York State in suing the U.S. EPA several times to get reports out that reveal that the Clear Air Amendments of 1990 were not adequate to protect the Adirondack Park and many other sensitive areas.

We have continued to generate and to publicize scientific inquiries that verify the need for additional action. We have had a string of our New York Senators—D'Amato, Moynihan, Schumer, and Clinton—all introducing legislation trying to make this the No. 1 environmental priority in New York. As I mentioned in my testimony, Governor Pataki has already implemented regulations that, in effect, have adopted the Moynihan proposal.

So the difficulty in the last couple of years has been the ongoing controversy over carbon dioxide and global warming. We would be pleased to see a bill move out of this committee and onto the floor that has provisions on climate change and global warming. We would not be pleased to see any controversy or lack of agreement on that one issue keep us from moving forward on the very desperately needed measures for sulfur, nitrogen, and mercury.

Senator VOINOVICH. I think last year when we contacted you, you indicated that same position. I think at that stage of the game you were in favor of a more aggressive program that we had talked with you about. It was not Clear Skies.

But you feel that the numbers in Clear Skies will move down the road and start making some difference for you?

Mr. MELEWSKI. Yes, absolutely. As I stated in my testimony, the Moynihan legislation represented the minimum that needs to be done, in our opinion, to change the course of direction in the Adirondack Park. Clear Skies meets those same standards and exceeds them. In fact, all the major proposals that have been introduced in

this committee, or are about to be introduced, as Senator Carper mentioned, would resolve the acid rain problem.

The facts are that the faster we get the cuts and the deeper the cuts are, the quicker the biological recovery will occur in the Adirondacks. If we had to choose between deeper and faster, faster would be the choice.

Senator VOINOVICH. You just want to get going?

Mr. MELEWSKI. We just want to get going.

Senator VOINOVICH. Mr. Rogers, obviously one of the major drivers for Clear Skies is the need for regulatory certainty. Can you explain why certainty is so important to your company, especially with regard to your need to raise capital that will fund the pollution control projects that you need in the future?

Once you have answered that, I would be interested in your comments about living in this regulatory environment that we have been in for the last couple of years. What impact do you feel it has had on your ability to make the air cleaner, improve public health, and provide more efficient energy?

Mr. ROGERS. The key to certainty, Senator, really is having a road map so that you can do the work in a systematic way on each of your power plants. What that requires is knowing what the SO_2 regulations will be, what the NOx regulations will be, what the mercury regulations will be. We sit here today with no clarity with respect to what those regulations will be in the future.

What Clear Skies offers is a clear path. It allows us to time investments. Our company's balance sheet was under tremendous pressure. Many of the coal-fired utilities' balance sheets have been under great pressure of just complying with NOx.

This work on the back end of your plants is in terms of building scrubbers, but at the same time maintaining the reliability of your system. If you phase it in over the right period of time, not only do you maintain the integrity of your balance sheets, you attract the necessary capital to make the investments, but you smooth out the impact on consumers over a period of time rather than having steep increases.

The primary reason we support Clear Skies is that it gives a clear path and allows you to plan investments, to plan construction, and at the end of the day, it translates into delivering cleaner power at lower cost.

One of the challenges we have had, is there has been so much litigation, for instance, around NOx. The time lines have been compressed, and that translates into greater costs and a greater need for workers that are qualified. We also need to make the right investments.

So from our standpoint, timing matters. The sooner we know the plan, the sooner we go to work. We are able to execute this over a period of time and that translates into lower costs for consumers. That is very important.

Senator VOINOVICH. We have to strike a balance. We heard from Mr. Hawkins that we ought to move forward. When do you get to the point that you say to your shareholders that it is better for us to fuel switch to natural gas? If that happens, then as I mentioned in my opening statement, you then have a situation where the cost just skyrockets. You have a lot of people to just pick up and leave.

Where is that balance? We are talking about numbers and we are talking about time. You want to strike that. What is your reaction?

Mr. ROGERS. I think the industry has actually, interestingly enough, almost defaulted to a place where we have increasingly become dependent on gas-fired generation. As I mentioned, as an industry, we have built 10 years of capacity in a 3-year period. It is all gas-fired. No other time in our history have we been so dependent on one fuel.

Our company, for instance, has added 2,000 megawatts of gas-fired peaking. We are converting one of our small coal plants to gas. But at the end of the day, there are limits on how much you can switch to gas. I think you already see that. Nobody in their right mind is going to plan to build a coal-fired plant which takes five to 7 years to build when you do not know what the regulations will be with respect to SOx, NOx, or mercury.

It leaves the industry in a place where you continue to default to gas-fired peakers. That is not the long-term solution for this country, to become so dependent on one fuel.

Senator VOINOVICH. Let me tell you what worries me. If you have reached that point where that decision is made for fuel switching, it impacts on your industries. Your industries leave. As I told Senator Jeffords last year, they are not going to Vermont. They are going somewhere else.

I do not think a lot of people who are involved in this issue understand how devastating natural gas prices are today, not only on heating costs but what they have had on electric costs. We move the jobs out of the United States to some other place that burns coal. They do not have the types of environmental concerns, and in terms of the environment of the world, we have made no progress.

If you can keep the pressure on to get you to use clean coal technology and other technology for mercury and other things, that you keep the jobs here, you develop the technology, and then you can either sell or give that technology away to other countries in the world that are going to be out there manufacturing this stuff. That is the delicate balance that we have to try to achieve.

Mr. ROGERS. Unfortunately, Senator, there is no silver bullet for these issues. We have to invest in technology. At the same time, we have to work to help our customers become more efficient in terms of their use of energy. At the same time, if we do not pay attention to the supply/demand balance on the gas side and if we continue to default to more and more gas-fired generation, that is going to translate to times where we could not run some of our gas-fired units when we needed them because there was no capacity in the pipelines. You need that kind of infrastructure investment that had not occurred. You need to look at the prices this summer and the number of plants that shut down for the short term—but it could be for a longer term.

One of the great fears of the gas industry is that the volatility of the gas prices and the rising gas prices forces a lot of industries, as you suggested, to basically pack up and leave town and leave the country. That is not a good answer long term for creating jobs.

What I worry about is jobs. We are in an economy where the growth is only two to two-and-a-half percent. That is still better

than other parts of the world, but not what we expect, and not what we hope for. If prices of gas continue to go up and we do not use the resources that we have in an environmentally responsible manner, we have created a death spiral for ourselves that makes it even more difficult for us to succeed as a country.

Senator VOINOVICH. Thank you.

Senator Carper?

Senator CARPER. Thank you, Mr. Chairman.

To each of our witnesses, we are glad you are here. We

appreciate your testimony and your responsiveness to our questions.

I do not mean to pick on you, Mr. Rogers. Let me just ask my first question of you and then we will pick on some others. I want to read you a statement by a leader of a major utility company. I just want you to listen to it and then react to it, if you do not mind. It is quote. It goes back to sometime in 2001. It says:

"My company seeks comprehensive multi-emissions power plant legislation because we want long-term clarity and certainty built into our environmental compliance and planning process. This kind of reasoning dictates the necessity of including a carbon commitment in the legislation. Without some sense of what our carbon commitment might be over the next 10, 15, or 20 years, how can I or any other utility CEO have an adequate picture of what the future requirements our plants may face? How can we prudently plan?"

You probably recognize those words because they are your own. Those were words that I am told that you stated in a presentation in September 2001 before a forum on applied research and public policy.

I do not recall everything that I say anyone that I suspect any of the rest of us do. But I found that to be a powerful statement and one that I certainly welcome. I do not know you well, but I know your reputation, and your reputation is a person who says what he thinks and someone who can take what he says to the bank.

I presume you meant what you said in 2001. I would just like to ask you to reflect on what you said and think about it today.

Mr. ROGERS. Thank you. My staff read that back to me in preparation for today.

[Laughter.]

Mr. ROGERS. I am here to say that it was just as brilliant then as it might be perceived today. Let me make a point—and this is from a personal standpoint and not speaking for EEI. I am just speaking for Jim Rogers, CEO of one company.

We burn 30 million tons of coal a year. We have significant emissions. As a consequence of that, we have a responsibility to get it right, not only with respect to our emissions, but with respect to the costs to our consumers. I am concerned about climate change. I think it is an issue that we need to address. But we need to have in this country reasonable expectations about what is possible.

Yes, we want certainty. One of the things I said in a more detailed way is that we need to find a way to take a risk at first strategy that allows us to flatten the curve. I think the reduction in carbon intensity is a step in that direction. There has been a

number of voluntary steps that we have taken as a company, and in fact, that our industry has taken, to reduce CO_2 emissions. These are all steps in the right direction.

But unfortunately we cannot have the certainty that we desire. One, we have yet to find a technology that really reduces CO_2. That is an issue. We have not found a substitute for the coal-fired plants and gas-fired plants that we have in this country. Yet, we still have a requirement to keep our TVs on and to run our computers and to maintain the lifestyle that we have grown accustomed to.

I think we need to go to work. I think we are going to work. There are many voluntary programs, first steps, good steps, more investments in technology. But we need to work to reduce our carbon intensity. We have taken steps in that direction.

I believe this is an issue that we will not go away. It is an issue that we have to deal with. But I do not think at the end of the day—and I going to be blunt with this point—there is a lot of theology around it also. I will not dare go there. I will leave that to you.

But I think the importance of making progress on SOx, NOx, and mercury is great. I look to the difficulty that the Senate had in just coming together around the simple question of reporting emissions. I think that will become even more difficult to do more than even that.

I am a realist. I say and I urge you to think. We need to make progress with SOx, NOx, and mercury. Let us not fight for days and months and years around CO_2 while we ignore making progress on those three pollutants. I would urge you to continue the debate, to continue the investigation, to continue the investment in new technologies, and to continue to issue on the front burner, but not delay moving forward on these other things, waiting to come up with the perfect solution for that.

In an ideal world I would love for it to happen. But I do not think it going to happen for the reasons I stated.

Senator CARPER. About once a week I hear someone here on Capitol Hill say, "Don't let the perfect be the enemy of the good." I was very encouraged when I read your statement. I realize there was something said about 18 months ago. I appreciate the way you have spoken today—I think from your heart.

I would just like to my colleagues on my right and my left. I think there are other CEOs of utilities around this country who share that conviction, who are not comfortable with the idea that we are putting as much carbon into the air from a lot of sources as we are and what the long-term consequences for us, whether we are in Tupelo, Mississippi, Cleveland, Ohio, Vermont, or Delaware.

I want to ask a question, if I could, of Mr. Trisko. You may have been in the room earlier in the day when I introduced myself as the only native-born Senator from West Virginia and one who still has a lot of family in West Virginia and who goes back there from time-to-time for a reunion at Grand View State Park. If I would take a course here in Congress that undercut coal, I could go back to the reunions, but I would not be as warmly welcomed as I might want to be.

I would like to ask you to share with us what are some recent developments, particularly as we look forward, to being able to use

our abundant coal resources, to use them to create energy, electricity, but to do so in a way that we do not have problems with the kind of problems we have had in the past with coal with respect to SOx, NOx, and mercury.

I have heard just in the last 24 hours some really inspiring information about reductions in those emissions from coal, and from a coal that has been turned into a gas. Talk to us about that kind of technology.

Mr. TRISKO. Senator, I would be happy to, on a couple of levels.

First, in terms of the pragmatic and what is necessary for utilities to achieve the kinds of reductions that are called for by Clear Skies. There has been very significant progress made in the last decade in particular on technologies that reduce SO_2 emissions and NOx emissions.

Scrubbers, particularly the so-called magnesium-enhanced limestone scrubbers—lime or limestone, but those that utilize a magnesium enhancement—are capable of achieving in excess of 95 percent removal of SO_2 at a quite reasonable cost per ton. In some cases, it is 98 percent or more. As a byproduct of the scrubbing process, you also achieve mercury reductions.

NOx technology improvements also are notable. In the last few years, largely as a result of the emphasis on reducing transported ozone in the Eastern United States and the development of EPA's SIP call, the commercial development of selective catalytic reduction technology has progressed quite rapidly. It had been used in Europe and in other countries. It is our understanding that SCR technology now is capable of achieving NOx emission rate limits at coal plants of NOx at 0.7 pounds. That would be for a large base load plant application.

One of the greater difficulties that we see in terms of the pragmatic here and now in complying with multi-emission legislation really is in the mercury area. While it is true that the use of conventional emission control technologies such as scrubbers—and some particulate control equipment—reduces mercury as a byproduct, we do not have a commercially demonstrated system.

The activated carbon injection technology that EPA relies upon largely in its models to estimate the prospective costs of mercury of Clear Skies, that technology has only been applied at a handful of plants on a demonstration basis. Those plants were selected based on the generous size of their particulate removal equipment. They may not be representative of the hundreds of coal plants that do not have that particularly generous particulate electrostatic precipitator configuration.

Looking forward over the longer term, there certainly is reason for optimism in terms of the development of advanced clean coal technologies going beyond conventional pulverized coal systems, such as integrated gasification combined cycle equipment that will virtually eliminate the emissions of criteria pollutants, and as a consequence of their improved thermal efficiency, also make great progress in terms of carbon reductions.

But for purposes of legislation or regulation at the current moment, we are not quite ready for prime time in terms of those systems. That is why the kinds of programs that the Administration is advancing through its clean coal technology programs to us

makes sense as a form of insurance. We are not just the Saudi Arabia of coal. Our coal reserves in their energy content are equivalent to the world's known oil reserves. But those kinds of technology developments make a lot of sense to ensure that that resource in the future will be available for our use.

Senator CARPER. Thank you.

Mr. Chairman, if we have a chance to ask a couple of other questions later, I would like to. My time has expired for now.

Senator VOINOVICH. Senator Jeffords.

Senator JEFFORDS. Mr. Hawkins, I would like to know if you have any comments on the EPA or the other witnesses' testimony that you have not had a chance to make and would like to make.

Mr. HAWKINS. Yes, Senator Jeffords. Maybe I will make a comment on a theme that has been raised by a number of Senators and the panel, and that is the topic of coal. The fact is that the status quo is not good for U.S. coal, in addition to being not good for the climate.

The current uncertainty about what is going to happen with climate policy is causing investors to behavior rationally. What do I mean by that? They are not investing in coal. The forecast for new capacity in the United States is not going to coal. It is going to natural gas. Because of that uncertainty, the only entities that are proposing to build coal plants are coal companies. With few exceptions a power company will not even make the effort to try to permit a significant coal plant.

Basically, the uncertainty about global warming policy has caused people to be nervous about investing in conventional coal. And that uncertainty has caused them to not have sufficient incentive to invest in advanced coal technologies either.

Senator Carper asked the question about technologies for carbon. In his own State, Delaware, there is advanced technology in operation today at the Motiva Refinery. The feed stock is not coal. It is petroleum coke. But the technology is basically the same. It is commercially demonstrated. You put the coal or the petroleum coke in there. You gasify it. Then in order to manage the carbon, you need to capture the carbon and you need to do something with it.

In this country we are storing CO_2 for purposes of oil recovery in enhanced oil recovery operations. We are storing 30 million tons of it a year. All of the elements of a strategy that would allow coal to continue to be used, and decouple it from a global warming problem, are out there today. They are not being used in an integrated package because there is absolutely no market incentive to do so.

That is going to stay that way until this committee starts the process rolling. It is not too soon to start it. We can develop a program that sends the signal that gets people moving and gets the investors making the right decision. Eugene Trisko and I could sit in a room and come up with something. I think it would address the needs of the coal industry and it would address the needs of protecting the climate. It would provide business certainty. I think it would address Jim Rogers' needs as well.

We just have to get over what is an irrational fear of addressing this issue. It will not get easier. The longer we ignore it, the harder it will get.

Senator JEFFORDS. Thank you. That is very helpful.

Mr. Colburn, what would Clear Skies do to your State's abilities to protect public health, achieve attainment, and to operate their existing pollution control programs?

Mr. COLBURN. Senator, there are several ways that State authorities would be impacted. I have listed several on an attachment to my testimony. Perhaps rather than go through those individually, I will cover just a few of the high points.

The most important aspect of your question is what happens following whatever Federal solution or Federal reductions emanate from a bill passed by Congress this session. Under Clear Skies, for example, it is not clear that the reductions achieved will produce attainment everywhere in all the States. Under Federal law now, the States have the responsibility for achieving Federal health-based air quality standards.

If the States lose any of their current regulatory authorities as a result of Federal multi-pollutant legislation, it is not clear what mechanisms they will use to fulfill this responsibility to achieve attainment. One of our biggest fears, then, is the apparent reduction in State authorities that are incorporated in the Clear Skies proposal. We feel, as I indicated in my testimony, that it is a far safer and far better approach for States to retain all the authorities that exist in the current Clean Air Act and not need to use them if attainment is reached everywhere or is easily reached with a few additional mechanisms that States impose. This approach is much more likely to guarantee that healthy air quality is achieved than depriving States of those tools, as called for in some of the provisions of Clear Skies.

If the tools are not used, that is wonderful. A State that is in attainment cannot use Section 126, for example. I think that is the outcome we all want.

In addition, there are other hazardous air pollutants besides mercury emitted by the power sector. It may be that scientific investigations now under way show that several of those should be regulated in form or another. States currently have the authority to do so.

That authority is deleted under Clear Skies. There is a little bit of a question about this, Senator, but it even appears that under Clear Skies State actions to go beyond Federal requirements to meet their State SIP requirements, may be prohibited or constrained.

Essentially the States feel that while Clear Skies itself represents a good step in the right direction, perhaps not as far, or as fast, or for as many pollutants as need be, they are fundamentally getting their arms tied behind their back in exchange for that down payment of initial reductions. It is not clear to us that that will end up being a good trade in the end. We are concerned about that.

Senator JEFFORDS. Thank you.

Mr. Trisko, would your Union support a CO_2 cap that would produce no significant impact on domestic coal production?

Mr. TRISKO. Senator, that is a hypothetical question. I learned in law school a long time ago to avoid answering hypothetical questions, but I would be happy to comment upon the question.

First of all, I am not at liberty to state whether President Cecil Roberts of the United Mine Workers would or would not support

such a hypothetical cap. You would have to address the question to him directly. But that being said, given the wealth of analytical evidence that is available to us through the studies that have been done leading up to Kyoto and subsequent to Kyoto for the design of an alternative "Kyoto-lite" approach, however it might be characterized, we have yet to see a program that would cap domestic utility carbon emissions that would not have adverse effects upon coal consumption.

One analysis that has been made available to us was done by a private group—for the bill that Senator Carper is currently associated with—analyzed the prospective impact of those emissions caps on the domestic utility industry. It suggested that in the worst case the bill could be associated with a 41 percent reduction of coal utilization.

We would like to see and encourage the committee to pursue additional analyses of alternative measures. In fact, when the mine workers were approached last year for their prospective support to Senator Carper's proposal, that was our request. We want to see the numbers. We want to understand what the bill would do.

Senator JEFFORDS. Thank you.

Mr. Melewski, why does the Adirondack Council support legislation that eliminates the New Source Review Program?

Mr. MELEWSKI. Well, Senator, first of all, I do not think the Clear Skies program eliminates the New Source Review Program. There is a moratorium on new initiatives for a period of years. There is a troubling new standard that is provided in the Clear Skies bill. We do not offer any particular expertise in those provisions. They have been intensely discussed since the bill was introduced. I know that many members of the committee have problems with them.

We can offer a simple solution that is one that was taken in 1990 which is to keep the existing Act in place and create new programs on SO_2, NOx, SOx, and hopefully something on the climate change.

Senator JEFFORDS. Mr. Chairman, that exhausts my present desires to pursue anything more. We will expect the answers to our questions that have been submitted.

Thank you.

Senator VOINOVICH. Thank you.

I just have one last question for the panel. You have all heard each other comment about each other's testimony. Would any of you like to comment on any of your fellow panelist's testimony?

Mr. Colburn?

Mr. COLBURN. Thank you, Mr. Chairman. I would make one comment. I think Mr. Trisko raised an extremely important point when he suggests that at the current time the situation is such-and-such. I would remind the committee that we are not talking about the current time. We are talking about 15 years from now.

The reason that is important, Senator, is this. I was the Air Director of the State of New Hampshire in 1995 when we installed the first selective catalytic reduction NOx control technology (SCR) on a coal-fired plant in, I believe, the world, but certainly in America. Soon after that, there were deliberations as part of the OTAG process (Ozone Transport Assessment Group), in which industry indicated how impossible it was to secure the steep reductions in Nox

reductions that we were already getting. I was the only guy there with canceled checks about how much it would actually cost to control NOx.

That process essentially took 6 years—1995 to 2001. Now, we are looking at the ability to replicate a 6- or 7-year process like that—twice—before Clear Skies would be fully implemented. In terms of coal use, I think there is a strong technology opportunity for the integrated coal gasification that Mr. Trisko and Mr. Hawkins mentioned that could create a bright future for coal. This technology would preserve and potentially even increase coal usage while diminishing dramatically its environmental impacts.

Right now there is an energy penalty for coal gasification. In the way we use coal today, we are paying a health penalty. Let us pay the energy penalty instead, and stop paying the health penalty, and do so in the next 5 or 6 years instead of the next 15 years.

All of this can be done. It has been done. It has been done at less cost than EPA ever estimated, just like the acid rain program. We do not have to have it all in the bag today. We have seen in the past the progress that has been made when we set our minds to it.

Perhaps my favorite saying is: If you ask an engineer to do something, you will get nothing but problems—why it cannot be done as fast, what could go wrong, and so forth. But if you tell an engineer to do something, you will get nothing but solutions.

That is what has happened in the past, Senators, when Congress told the engineers and companies like Mr. Rogers' to do something. They go to it and achieved spectacularly beyond our expectations. They will do so again.

Senator VOINOVICH. As a Governor of a State that encouraged a company to put on a $650 million scrubber at the Gavin Plant, an extraordinary amount of money has gone into these investments. This new SER technology was done at Gavin. They had to buy out a town in the vicinity there because of a plume that settled over the town. They just finally just bought the property.

I think this concept of this technology is around the corner. We have a long way to go. It is very expensive.

One of the things that puzzles me is that last year Tom Moynihan from Catholic Charities testified about the cost of energy on poor people. Clean Air Trust put them on. He was the villain of the month because he testified about that.

You talked about deaths of 30,000 people. If they cannot afford their energy cost and they cannot afford their air conditioning, then they die. You talked about individuals that lose their jobs. They go overseas and they do not have the money to pay for health care, they are not in very good shape.

It is very disturbing to me. It is very typical here in this Congress. We do not really very often put each other's shoes on and try to work with each other to figure out how things should be worked out. That is why we are not really getting very far here. It is a very frustrating place to be for me as a Governor and as a Mayor who was able to try to work things out.

Mr. Trisko, I would like you to comment.

Mr. TRISKO. Senator, thank you. In exchange for your remarks, I will be quite brief on this subject. To paraphrase the gentleman

from Tupelo, it is now or never for this legislation. It is now appropriate for the Congress to move a three-pollutant bill. If Congress delays and there is further inaction, we may lose the opportunity to realize the benefit of the public health and environmental protections that the bill offers.

Mr. ROGERS. Mr. Chairman, I would like to echo Mr. Trisko's comments. I do think now is the time. I think one of the themes that is consistent among all of us here today—and I have tried to listen carefully to the themes—one of the themes that emerges is that the Clean Air Act is not working. It needs to get fixed. Now is the time to fix it. I think everybody here recognizes that.

My dad was a lawyer. He used to say that the devil was in the details. My mom quickly responded that God is in the details. The way I understand this issue I think there are enough details for the both of them.

I would urge you to roll up your sleeves as you do, and you have, and you did as a Governor, and go to work. Work through the details, find the right sets of compromises, and go to work so that we can turn our engineers loose. We can turn our people loose and go to work and solve the problems in a way that allows us to meet our energy goals, meet our environmental goals, keep our economy going, and keep jobs in the U.S. That has to be an important ingredient in this whole discussion.

Senator VOINOVICH. Mr. Hawkins?

Mr. HAWKINS. Senator, if I might make a comment on costs. Of course you are right. It is important to consider the costs of policies you adopt. But EPA has done that consideration and it has presented you some of that information. That is more that they have to present. If requested, perhaps they would do so.

But the analyses that they have conducted, for example, of the more protective option that the Administration rejected, had a compliance cost of $10 billion a year. Those are EPA's calculations. The electric sector revenues in 2020, which is the forecast year, are $330 billion. So $10 billion is a lot of money. But $10 billion as an addition to a $330 billion total is a small amount of money. It is about a 3 percent increase in the cost of generating electricity. That is not a large amount of money.

The same analysis was done to examine a policy that would have capped emissions at 75 percent reductions for SOx, NOx, and mercury, and imposed a carbon cap at year 2008 levels. That analysis was done in response to your request to the Energy Information Agency back in the spring 2001.

EIA came back and said that that would raise the average electricity rate from 6.7 cents per kilowatt hour to 7.1 cents per kilowatt hour. That is about a 5 or 6 percent increase.

In terms of poor people's needs, of course those should be addressed. Senator Jeffords' bill has provisions in it which could be incorporated into a piece of legislation that calls for establishment of a public trust that could make funds available for things like lifeline rates and other purposes to make sure that there is no adverse impact while we actually go about protecting health and starting to address global warming.

There are ways to solve these problems. We want to work with you to try to find them.

Thank you.

Senator VOINOVICH. I do a lot of meeting with people in my State. We are in a global market place. It is very interesting that another great cost that they all have is health care costs. They are competing with other countries that do not have the same health care costs. You just start adding all of this up. It is not really a rosy scenario about jobs in this country and where are going. I think we have to realize that we are in a global market place and that the environmental concerns that we have also have to be balanced with the economic concerns of the people in our country.

Senator Carper has one more question. I think we will then wrap it up.

Senator CARPER. Thank you, Mr. Chairman.

In your testimony, Mr. Colburn, I believe you said—and I am going to paraphrase you—you said that carbon does not need to be onerous. It does need to be in the bill.

Give us some idea of the approach you would have us take with respect to carbon.

Mr. COLBURN. Senator, I think that even the greatest trading foes admit that trading of carbon dioxide does make sense because its impact is global. There are no local impacts from climate change. It is all global impact. There are impacts that happen locally, of course. But carbon dioxide's impact on climate change is a global concern.

While many horror stories have been suggested about carbon taxes or carbon control costs in the $25, $50, or $100 range per ton, I think an effective mechanism could be established—probably through a cap, but a lenient enough cap such that the effective price of carbon were very small at a very small cost. I would rhetorically argue for perhaps 25 cents per ton.

The important thing is what you said before, Senator: Markets work. Well, if markets work, let us get carbon in the market. Let us not pat it on the head and give it some technology development money and shoo it away. Let us get it in the market. Let us do so in a way that is not terribly onerous with a cap that does not create a substantive burdens for Mr. Rogers' company and other utilities. But let us let the market work on carbon.

Senator CARPER. Senator Voinovich was talking earlier about the economic impact of what we are discussing here. To the extent that we drive up the cost of energy for our consumers, including for industry, manufacturing businesses as well, there is a concern that we hasten the exodus of manufacturing jobs from this country. We ought to be concerned about that. I know that I am. We ought to be concerned about the out-of-pocket costs for consumers for buying their electricity. We are all mindful of that.

Earlier I said in my questioning of another witness, that the Clean Energy Group has actually done an analysis of a 4–P bill which includes carbon dioxide, and concluded that if we added a fourth pollutant, carbon dioxide—to a 3–P bill, SOx, NOx, and mercury—that we would see over the next 15 or so years an increase of about 1.5 percent the cost of adhering to emissions requirements.

It is not free, but it is 1.5 percent. It does provide a measure of certainty. To this Senator and former Governor who cares a lot about economic development and maintaining jobs, where do we do

reach a tradeoff? What is acceptable—a 1.5 percent increase? Those are not my numbers. Those are the numbers from the Clean Energy Group.

But to have the kind of certainty and arguably taking real steps toward addressing global warming, is that an unreasonable tradeoff? I would ask any of our witnesses to respond. Mr. Trisko?

Mr. TRISKO. Senator, my first question with respect to the economic impact that you cited from that study was whether the Clean Energy Group had analyzed the impact of the proposal nationally or whether that was an impact related to its generation sources. The Clean Energy Group is primarily fueled by oil, nuclear, and natural gas. It has some coal generation, but it is not representative of the Nation's coal-fired utilities.

Senator CARPER. I understand that it is national. It is not just the Clean Energy Group. It is national, which I think makes it even more of significance to us.

Mr. TRISKO. One of my previous responses to the committee's questions encouraged the committee to pursue analyses through EIA, EPA, and others, of alternative approaches. We would certainly be interested in seeing that study when it is released.

My second point with respect to the reasonableness of the impacts is from a more global perspective. I have attended every international negotiation session since the Rio Treaty was negotiated in 1992—Geneva, Bonn, Kyoto, Buenos Aires and others.

We have in the climate change arena an extremely serious breakdown of the negotiation process that must be remedied. If you believe in the seriousness of the problem, and you believe the science in all good faith, that international breakdown must be remedied if progress is to be made on this front. The developing countries, led by the G–7 and China, essentially have repudiated any effort, however offered in good faith to discuss future limits on the growth of their emissions. These are not absolute constraints or cutbacks or rollbacks, but merely to discuss future limits on the growth rates of their emissions.

The United States put forward an "evolution" proposal in Kyoto in 1997 that said, "Listen, we, Annex One industrial countries, we are meeting here in order to agree on substantive emissions reductions. But we have a political problem. Recognize our political problem. We cannot go back to our capitals. We cannot go back to Washington empty-handed and say, we have just agreed to negotiate among ourselves—Europe, the United States, and Japan—a set of emission reductions. We need to have some sign from you, from India, from China, from Brazil, from Korea, from Mexico. We need some sign that after we meet our reductions, that you will then be willing to sit down and talk about future limits so that we can have a global agreement."

That proposal, which we put forward through New Zealand—they tend to be more articulate than we are, and they sound a lot more diplomatic—that proposal triggered a 5-hour filibuster. It subsequently led to the removal of the issue of evolution from future United Nations meetings. We must solve this fundamental problem at a global level before we can make progress on the issue of climate change.

Senator CARPER. I think that is a good cautionary note. I do not know these numbers off the top of my head. It would be interesting to know, to the extent that there is carbon dioxide that is emitted from manufacturers, from utilities, and from other sources, what portion of global CO_2 emissions from the U.S. versus some of the other nations that you have mentioned.

That does not take away from the validity of the point that I think you are making.

Mr. Hawkins, do you have a closing comment?

Mr. HAWKINS. Yes, I agree with Eugene Trisko that we need to have an effective strategy for addressing the engagement with developing countries. But sitting back and telling them that they should shape up is not an effective strategy. An effective strategy is using good old fashion American know-how, applying it to the job, showing the world that it is easier to solve this problem than they think, and that they need not be afraid of it. We can do that.

We have the capacity in this country, the biggest economic power on earth, to prove out these technologies. When you are out of the room, Senator, I mentioned the Motiva Refinery in your own State, which is operating gasification technology to convert a filthy fuel, petroleum coke, into a clean energy source. That same technology can be used, and would be used, if we start to apply the market signal that Ken Colburn is talking about.

When we do that, we will have something to talk to China and India about. China is going to build 500 gigawatts of new coal-fired capacity in the next 30 years. We will have something to talk to them about. We will say, "Look what we are doing in the United States. We are evolving into modern technology. We are going to use our coal without messing up the planet with climate change. You can do it, too."

We are actually demonstrating that it is affordable. That is what we can do and that is how we can start to break these logjams.

Senator CARPER. In response to what Mr. Hawkins has said, we worry a lot about the exporting of manufacturing jobs. I know I do. I know others do. Would it not be great if we could somehow export technology to address these kinds of concerns.

Mr. Rogers, your quick comment.

Mr. ROGERS. Senator, let me make an observation with respect to that study. While I have not studied it in great detail, I would observe that it is a national number. Let us not forget that any kind of legislation that adversely affects coal is going to have a disproportionate impact on the Midwest and the Southeast.

I think we really need to keep that in mind. Since I am in the Midwest, I know we serve the steel industry, the auto industry, and the chemical industry. They are going to be adversely impacted in a dramatic way.

While it is interesting to have a national number, when you look at the Midwest where 80 percent of its energy comes from the burning of coal, we need to remember it is going to have a disproportionate impact on that part of our economy. That is the industrial heartland of this country.

With respect to the whole carbon issue worldwide, let us not get fooled with even the European countries. While they stepped up and gave lip service to Kyoto, countries like Germany, for instance,

have agreed with the Green Party to shut down their nuclear units. How are they going to serve their demand in that country and reduce their emissions? They will not and they cannot.

The same is true with Spain. We used to own wind farms in Spain. We saw that they started to change how they dispatch renewable. We started to discount it. We sold our assets and left. While they pay lip service to it, the reality is that their day-to-day behavior indicates anything but the capability to achieve those targets. We need to be circumspect in our approach and not get tricked by the lip service that others may pay.

Senator CARPER. Mr. Chairman, I have no more questions.

I would like to make a quick brief comment. I am encouraged by today's hearing. I am encouraged by what I have heard here and in other earlier witnesses. I am encouraged by the kind of comments that Mr. Rogers made today and his comments of September 2001. He spoke with sincerity then and today.

Mr. Trisko's explanation and description of the kind of new technology which would enable us to pull coal out of places like West Virginia and to use it in its abundance in ways that do not harm our environment and our air in the way they do.

Jim Riley, who sits right behind me, reminded me of a visit that we paid to W.L. Gore. They make Gortex, but they make a lot of other products as well, including an infiltration system that is being used on a demonstration model down in North Carolina. The demonstration project is run by the EPA. They are removing mercury out of the air emissions by more than 95 percent. I am encouraged by that kind of technology and the potential of what they can mean to us for cleaner air, and at the same time to enable us to stay in business and to be competitive as a Nation.

Each and every one of you is most welcome. Thank you all.

Senator JEFFORDS. Mr. Chairman, I have a question. I ask that three documents we have be made a part of the record. It is an analysis of the bill and two lists of studies of mercury.

Senator VOINOVICH. Without objection.

[Material to be supplied follows:]

Senator VOINOVICH. Mr. Melewski, do you have a quick statement to finish up?

Mr. MELEWSKI. Yes, I have a quick statement. It is a more esoteric observation about climate change.

I testified today that in 1998 we were here and had asked for similar changes to the Clean Air Act. My recollection is that the representative from Cinergy testified that it saw no reason to see a change in the Clean Air Act. Now we are here with Mr. Rogers 5 years later. We are both asking this committee to work together, to put a bill together, and move it to the floor. I think that is a significant climate change.

Mr. TRISKO. Evolution.

Senator VOINOVICH. Mr. Rogers said to us today, "It is time to move forward."

With that, we are adjourned.

[Whereupon, at 5:08 p.m., the committee was adjourned, to reconvene at the call of the chairman.]

[Additional statements submitted for the record follow:

STATEMENT OF HON. CHRISTINE TODD WHITMAN, ADMINISTRATOR, U.S. ENVIRONMENTAL PROTECTION AGENCY

I. INTRODUCTION

Thank you, Mr. Chairman and Members of the committee for the opportunity to speak with you today about the Clear Skies Act of 2003. Based on one of the most successful programs created by the Clean Air Act, Clear Skies is a proposal to substantially reduce emissions of the three most harmful pollutants from power generation and to do so in a way that is much faster and more efficient than under current law. As President Bush said in the State of the Union Address, Clear Skies will advance our goal of "promot[ing] energy independence for our country, while dramatically improving our environment." The Administration is committed to working with this Subcommittee and Congress to pass legislation this year. The widespread support for multi-pollutant legislation to reduce power plant emissions is a strong indicator that the time for action on this critical issue is now. Failure to enact Clear Skies this year will delay important public health and environmental benefits.

This country should be very proud of the progress we have already made in cleaning up our air. Since the Clean Air Act was first enacted in 1970, we have reduced emissions of the six primary air pollutants by 25 percent. During the same time period, the economy has grown significantly the Gross Domestic Product increased 160 percent; vehicle miles traveled increased 150 percent; energy consumption increased 40 percent; and the U.S. population increased 35 percent.

Although we have made much progress since 1970, we still face major air quality challenges in many parts of the country. Clear Skies is the most important next step we can take to address these challenges and achieve healthy air and a clean environment for all Americans. Clear Skies would make great strides toward solving our remaining air quality problems in a way that also advances national energy security and promotes economic growth. It would reduce power plant emissions of SO_2, NOx and mercury by approximately 70 percent from today's levels and do it faster, with more certainty, and at less cost to American consumers than would current law. Last year's EPA estimates project that, over the next decade, all the programs of the existing Clean Air Act would reduce power plant emissions of SO_2 and NOx by approximately 23 million tons. Over the same time period, Clear Skies would reduce emissions of these same pollutants by 58 million tons a reduction of 35 million tons of pollution that will not be achieved under current law[1].

When fully implemented, Clear Skies would prolong thousands of lives each year, providing billions of dollars in economic benefits, save millions of dollars in health care costs, and increase by millions the number of people living in areas that meet our new, more stringent health-based national air quality standards. Clear Skies would also virtually eliminate chronic acidity in northeastern lakes, reduce nitrogen loading in coastal waters, and help restore visibility in our national parks.

The Clean Air Act has been, and continues to be, a vehicle for great progress in improving the health and welfare of the American people. The Clear Skies Act substantially expands one of the most successful Clean Air Act programs the Acid Rain Program and reduces the need to rely on complex and less efficient programs. The result would be significant nationwide human health and environmental benefits; certainty for industry, States and citizens; energy security; and continuing low costs to consumers.

II. CLEAR SKIES PROVIDES SIGNIFICANT BENEFITS

The heart of Clear Skies is a proven cap-and-trade approach to emissions reductions. Mandatory caps restrict total emissions and decline over time. Clear Skies would continue the existing national cap-and-trade program for SO_2, but dramatically reduce the cap from 9 million to 3 million tons. Clear Skies would also use a national cap-and-trade program for mercury that would reduce emissions from the current level of about 48 tons to a cap of 15 tons, and would employ two regional cap-and-trade programs for NOx to reduce emissions from current levels of 5 million tons to 1.7 million tons. The specific caps and their timing are set forth in Table 1.

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[1]Except where otherwise noted, the projected emission levels, costs and benefits in this testimony are all based on analyses of the Clear Skies Act of 2002 conducted in 2002. EPA is currently analyzing the Clear Skies Act of 2003 using updated modeling assumptions and other updated information. We expect that the new analyses will be very similar to the 2002 analyses, but specific projections will likely change somewhat.

Table 1. Clear Skies Emission Reductions Timetable

	Actual Emissions in 2000	Clear Skies Emissions Caps		Total Reduction at Full Implementation
		First Phase of Reductions	Second Phase of Reductions	
SO_2	11.2 million tons	4.5 million tons in 2010[1].	3 million tons in 2018[1]	73%
NOx[2]	5.1 million tons	2.1 million tons in 2008[1].	1.7 million tons in 2018[1].	67%
Mercury	48 tons	26 tons in 2010	15 tons in 2018[1]	69%

[1]Because sources can reduce emissions early, earn allowances for those actions, and use those allowances later, actual emission levels will be higher than the cap in the first years of these phases.

[2]The NOx cap is divided between two zones with separate trading programs under each zone. Zone 1 includes the 31 eastern states in the continental U.S. and eastern Texas. Zone 2 includes the remaining states participating in the WRAP process as well as Nebraska, Kansas, Oklahoma, and some of Western Texas.

Although national in scope, Clear Skies recognizes and adjusts for important regional differences in both the nature of air pollution and the relative importance of emissions from power generation. The eastern half of the country needs reductions in NOx emissions to help meet the ozone and fine particle standards, which generally are not an issue in the western half of the county (with the exception of California, which does not have significant emissions from existing coal-fired power plants). The western half of the country needs NOx reductions primarily to reduce the regional haze that mars scenic vistas in our national parks and wilderness areas, and the nitrogen deposition that harms fragile forests. Recognizing these regional differences, Clear Skies would establish two trading zones for NOx emissions and prohibit trading between the zones to ensure that the critical health-driven goals in the East are achieved.

Clear Skies also recognizes the special visibility protection measures that have been developed by States participating in the Western Regional Air Partnership (WRAP). Clear Skies would essentially codify the WRAP's separate SO_2 backstop cap-and-trade program, which would come into effect only if the WRAP States did not meet their 2018 SO_2 emissions targets.

Finally, Clear Skies requires tough, technology-based new source standards on all new power generation projects and maintains special protections for national parks and wilderness areas when sources locate within 50 km of "Class I" national parks and wilderness areas.

Significant Public Health and Environmental Benefits

The public health and environmental benefits of Clear Skies present compelling reasons for its immediate passage. EPA projects that, by 2010, reductions in fine particle and ozone levels under Clear Skies would result in billions of dollars in health and visibility benefits nationwide each year, including as many as 6,400 prolonged lives. Using an alternative methodology, 3,800 lives would be prolonged by 2010. Under EPA's base methodology for calculating benefits, Americans would experience significant benefits each year by 2020, including:

- 12,000 fewer premature deaths (7,000 under an alternative analysis),
- 11,900 fewer visits to hospitals and emergency rooms for cardiovascular and respiratory symptoms,
- 370,000 fewer days with asthma attacks, and
- 2 million fewer lost work days.

Using the alternative methodology, by 2020 Americans would experience 7,000 fewer premature deaths each year.

Methodologies do not exist to quantify or monetize all the benefits of Clear Skies. Still, it is clear that the benefits far exceed the costs. EPA estimates that the health benefits we can quantify under Clear Skies are worth $93 billion annually by 2020—substantially greater than the annual costs of approximately $6.5 billion. An alternative approach projects annual health benefits of $11 billion, still significantly outweighing the costs. The Agency estimates an additional $3 billion in benefits from improving visibility at select National Parks and Wilderness Areas. These estimates do not include the many additional benefits that cannot currently be monetized but are likely to be significant, such as human health benefits from reduced risk of mercury emissions, and ecological benefits from improvements in the health of our forests, lakes, and coastal waters.

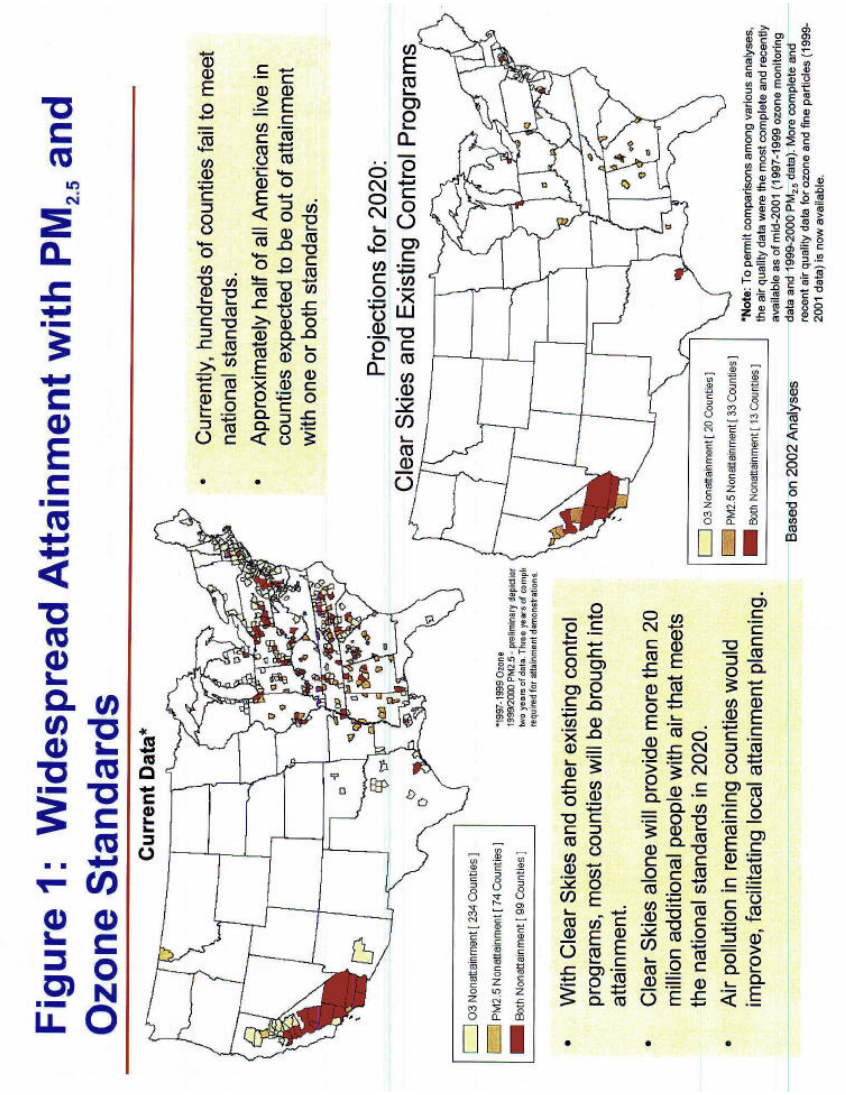
Clear Skies would achieve most of these benefits by dramatically reducing fine particle pollution caused by SO_2 and NOx emissions, which is a year-round problem. Of the many air pollutants regulated by EPA, fine particle pollution is perhaps the greatest threat to public health. Hundreds of studies in the peer reviewed literature

have found that these microscopic particles can reach the deepest regions of the lungs. Exposure to fine particles is associated with premature death, as well as asthma attacks, chronic bronchitis, decreased lung function, and respiratory disease. Exposure is also associated with aggravation of heart and lung disease, leading to increased hospitalizations, emergency room and doctor visits, and use of medication.

By reducing NOx emissions, Clear Skies also would reduce ozone pollution in the eastern part of the country and help keep ozone levels low in the western portion of the country. Ozone (smog) is a significant health concern, particularly for children and people with asthma and other respiratory diseases who are active outdoors in the summertime. Ozone can exacerbate respiratory symptoms, such as coughing and pain when breathing deeply, as well as transient reductions in lung function and inflammation of the lung. Ozone has also been associated with increased hospitalizations and emergency room visits for respiratory causes. Repeated exposure over time may permanently damage lung tissue.

Current estimates indicate that more than 350 counties fail to meet the health-based fine particle and ozone standards. As a result, 45 percent of all Americans live in counties where monitored air was unhealthy at times because of high levels of fine particles and ozone.[2] Clear Skies, in combination with existing control programs, would dramatically reduce that number, as shown in Figure 1. In areas where attainment is not projected, Clear Skies would assist those areas in addressing the air quality problems. Even counties currently measuring attainment would benefit from the reductions under Clear Skies. Throughout the West, Clear Skies would hold emissions from power plants in check, preserving clean air in high-growth areas and preventing degradation of the environment, even as population and electricity demand increase.

[2]These numbers are based on the most current monitoring data available to EPA. It is more current than the data that was available at the time that EPA conducted its analyses last year of the Clear Skies Act of 2002. The newer data confirms that we have serious air quality problems in many counties, but it shows improvement—fewer counties violating the ozone and fine particle standards. As a result, compared to last year's analyses, the new analyses may show less residual non-attainment (counties out of attainment in 2010 and 2020).



Clear Skies would also reduce mercury emissions from power plants. EPA is required to regulate mercury because EPA determined that mercury emissions from power plants pose an otherwise unaddressed significant risk to health and the environment, and because control options to reduce this risk are available. Mercury, a potent toxin, can cause permanent damage to the brain and nervous system, particularly in developing fetuses when ingested in sufficient quantities. People are exposed to mercury mainly through eating fish contaminated with methylmercury.

Mercury is released into the environment from many sources. Mercury emissions are a complex atmospheric pollutant transported over local, regional, national, and global geographic scales. EPA estimates that 60 percent of the mercury falling on the U.S. is coming from current man-made sources. Power generation remains the largest man-made source of mercury emissions in the United States. In 1999, coal-fired power plants emitted 48 tons of mercury (approximately 37 percent of man-made total). These sources also contribute 1 percent of mercury to the global pool.

Mercury that ends up in fish may originate as emissions to the air. Mercury emissions are later converted into methylmercury by bacteria. Methylmercury accumulates through the food chain: fish that eat other fish can accumulate high levels of methylmercury. EPA has determined that children born to women who may have been exposed to high levels may be at some increased risk of potential adverse health effects. Prenatal exposure to such levels of methylmercury may cause developmental delays and cognitive impairment in children. Clear Skies will require a 69 percent reduction of mercury emissions from power plants.

In addition to substantial human health benefits, Clear Skies would also deliver numerous environmental benefits. For example, under Clear Skies, we project that 10 million fewer pounds of nitrogen would enter the Chesapeake Bay annually by 2020, reducing potential for water quality problems such as algae blooms and fish kills. In fact, the Chesapeake Bay States, including NY, VA, MD, PA, DE, WV and DC, recently agreed to incorporate the nitrogen reductions that would result from Clear Skies legislation as part of their overall plan to reduce nutrient loadings to the Bay. Clear Skies would also accelerate the recovery process of acidic lakes, virtually eliminating chronic acidity in many Northeastern lakes. For decades fish in the Adirondacks have been decimated by acid rain, making many lakes completely incapable of supporting populations of fish such as trout and smallmouth bass. The Acid Rain Program has allowed some of these lakes and the surrounding forests to begin to recover; Clear Skies would achieve additional needed reductions. Clear Skies would also help other ecosystems suffering from the effects of acid deposition by preventing further deterioration of Southeastern streams. Finally, Clear Skies would improve visibility across the country, particularly in our treasured national parks and wilderness areas.

Clear Skies is designed to ensure that these public health and environmental benefits are achieved and maintained. By relying on mandatory caps, Clear Skies would ensure that total power plant emissions of SO_2, NOx and mercury would not increase over time. This is a distinct advantage over traditional command-and-control regulatory methods that establish source-specific emission rates but which allow total emissions to increase over time. Like the Acid Rain Program, Clear Skies would have much higher levels of accountability and transparency than most other regulatory programs. Sources would be required to continuously monitor and report all emissions, ensuring accurate and complete emissions data. If power plants emit more than allowed, financial penalties are automatically levied without the need for an enforcement action. More importantly, every ton emitted over the allowed amount would have to be offset in the following year, ensuring no net environmental harm. This high level of environmental assurance is rare in existing programs; Clear Skies would make it a hallmark of the next generation of environmental protection.

Reasonable Costs and Energy Security for Consumers and Industry

The President directed us to design Clear Skies to meet both our environmental and our energy goals. Under Clear Skies, electricity prices are expected to remain at or below current levels over the next decade. Our extensive economic modeling of the power industry looked at a broad array of factors to gauge the effects of Clear Skies on the energy industry and they all show that cleaner air and energy security can go hand-in-hand.

Clear Skies would maintain energy diversity. With Clear Skies, coal production for power generation would be able to grow by almost 10 percent from 2000 to 2020 while air emissions are significantly reduced. EPA's extensive economic modeling for Clear Skies demonstrates that the proposal's emission reductions would be achieved primarily through retrofitting controls on existing plants. Clear Skies's timeframe and certainty enable the power sector to meet aggressive emission reduction targets without fuel switching. This is important not only to power generators and their consumers who want to continue to rely on our most abundant, reliable, affordable and domestically secure source of energy, but also to other consumers and industries whose livelihoods could be hurt by a rise in natural gas prices. Our analysis shows that Clear Skies would not cause a significant increase in natural gas prices.

Under Clear Skies by 2010, about three-fourths of U.S. coal-fired generation is projected to come from units with billions of dollars of investment in advanced SO_2 and/or NOx control equipment (such as scrubbers and Selective Catalytic Reduction, which also substantially reduce mercury emissions). In 2020, the percentage is projected to rise to 85 percent. Cost effective strategies and technologies for the control of sulfur dioxide and nitrogen oxides emissions exist now, and thanks in good part to the Clear Skies market-based system improved methods for these pollutants, and for mercury, are expected to become increasingly cost-efficient over the next several years. In fact, the Institute of Clean Air Companies forecasts that the U.S. markets

for most technology sectors will remain fairly strong, adding momentum to the air pollution control technology industry. We expect that the Clear Skies Act will provide great benefits to American jobs in the engineering and construction industries.

One of the key reasons Clear Skies would be cost-effective is its reliance on cap-and-trade programs. Like the Acid Rain Program upon which it is based, Clear Skies would give industry flexibility in how to achieve the needed emission reductions, which allows industry to make the most cost-effective reductions and pass those savings on to consumers. Power plants would be allowed to choose the pollution reduction strategy that best meets their needs (e.g., installing pollution control equipment, switching to lower sulfur coals, buying excess allowances from plants that have reduced their emissions beyond required levels). Like the Acid Rain program, Clear Skies includes banking provisions, enabling companies to save unused allowances for future use. Banking creates a tangible, quantifiable, economic incentive to decrease emissions beyond allowable levels, which EPA projects will result in significant early benefits due to over-compliance in the initial years, particularly for SO_2. It also leads to gradual emissions reductions over time, and therefore a less disruptive transition to tighter emission controls needed to address lingering problems. Based on past experience under the Acid Rain Program, by placing a monetary value on avoided emissions, Clear Skies would stimulate technological innovation, including efficiency improvements in control technology, and encourage early reductions.

Assistance to State and Local Governments

Under the current Clean Air Act, State and local governments face the daunting task of meeting the new fine particle and ozone standards. Clear Skies would substantially reduce that burden. By making enormous strides toward attainment of the fine particle and ozone standards, Clear Skies would assist State and local governments in meeting their obligation under the Clean Air Act to bring areas into attainment with these health-based standards, and provide Americans with cleaner air.

Clear Skies' assistance to States goes beyond ensuring that power plants will reduce their emissions. Clear Skies relies on a common-sense principle if a local air quality problem will be solved in a reasonable timeframe by the required regional reductions in power plant emissions, we should not require local areas to adopt local measures. Under Clear Skies, areas that are projected to meet the ozone and fine particles standards by 2015 as a result of Clear Skies would have a legal deadline of 2015 for meeting these standards (i.e., will have an attainment date of 2015). These areas would be designated "transitional" areas, instead of "nonattainment" or "attainment," and would not have to adopt local measures (except as necessary to qualify for transitional status). They would have reduced air quality planning obligations and would not have to administer more complex programs, such as transportation conformity, nonattainment New Source Review, or locally based progress or technology requirements in most circumstances.

III. IMPROVING THE CLEAN AIR ACT WITH CLEAR SKIES

Clear Skies would improve the Clean Air Act in a number of ways. It would build on the proven portions of the Clean Air Act like the national ambient air quality standards and the Acid Rain Program and reduce reliance on complex, less efficient requirements like New Source Review for existing sources. The mandatory emissions caps at the heart of Clear Skies guarantee that reductions will be achieved and maintained over time. In contrast, uncertainties with respect to regulatory development, litigation, and implementation time make it difficult to estimate how quickly and effectively current regulations would be implemented under the current Clean Air Act. The level of SO_2 and NOx reductions we expect over the next decade with Clear Skies legislation could not be achieved under the existing Act. After that, we know that Clear Skies would achieve significant reductions, while both the timing and level of reductions under the current Clean Air Act are unclear.

Early Reductions

One of the major reasons we need Clear Skies now is that adoption of Clear Skies would provide greater protection over the next decade than the traditional regulatory path. The Clear Skies Act will result in significant over-compliance in the early years, particularly for SO_2, because sources are allowed to bank excess emissions reductions. For reasons described below, our analyses indicate that the cumulative SO_2 and NOx emissions reductions achieved by Clear Skies over the next decade would not be achieved in the same timeframe under the current Clean Air Act. Last year's EPA estimates project that power plants would emit 35 million fewer tons of NOx and SO_2 over the next decade under Clear Skies than they would under

the current Clean Air Act this more than doubles the reductions otherwise expected and would ensure significantly larger human health and environmental benefits. Our analysis suggests that the amount of pollution controls that the industry will have to install under Clear Skies over the next decade will stretch the limits of available labor and other construction resources, but can in fact be accomplished while maintaining energy reliability and continuing the downward trend in electricity prices.

Legislation Now Is Better than Regulation Followed by Years of Litigation

Even if Clear Skies is not passed by Congress, power plants will be required to reduce their emissions of SO_2, NOx and mercury. There is no more cost effective way than Clear Skies to meet the requirements of the current Clean Air Act or to achieve our public health and environmental goals. We know that, absent new legislation, EPA and the States will need to take a number of regulatory actions, although it is unclear now when the requirements will come into effect or what their control levels will be.

Clear Skies has several benefits over the regulatory scheme that will otherwise confront power generators. Clear Skies is designed to go into effect immediately upon enactment. Power plants would immediately understand their obligations to reduce pollution and would be rewarded for early action. As a result, public health and environmental benefits would begin immediately. Given Clear Skies' design, it is unlikely that litigation could delay the program (particularly since Congress would decide the two most controversial issues the magnitude and timing of reductions). In contrast, under the current Clean Air Act, power plants would not know what their obligations would be until after EPA and States started and completed numerous rulemakings.

Past experience suggests that litigation delays on the regulatory path are likely. Our experience with two cap-and-trade programs the legislatively created Acid Rain Trading Program and the administratively created NOx SIP Call illustrates the benefits of achieving our public health and environmental goals with legislation rather than relying solely on existing regulatory authority.

Though we project a great deal of benefits will arise from implementation of the NOx SIP call, the journey has been difficult and is not yet over. The NOx SIP call was designed to reduce ozone-forming emissions by one million tons across the eastern United States. The rulemaking was based on consultations begun in 1995 among States, industry, EPA, and nongovernmental organizations. A Federal rule was finalized in 1998. As a result of litigation, one State was dropped and the 2003 compliance deadline was moved back for most States. Most States are required to comply in 2004, although two States will have until 2005 or later. Meanwhile, sources in these States continue to contribute to Eastern smog problems. Although the courts have largely upheld the NOx SIP Call, the litigation is not completely over. Industry and State challenges to the rules have made planning for pollution control installations difficult, raised costs to industry and consumers, and delayed health and environmental benefits.

In contrast, reductions from the Acid Rain Program began soon after it passed (even before EPA finalized implementing regulations). There were few legal challenges to the small number of rules EPA had to issue and none of the challenges delayed implementation of the program. The results of the program have been dramatic and unprecedented. Compliance has been nearly 100 percent. Reductions in power plant SO_2 emissions were larger and earlier than required, providing earlier human health and environmental benefits. Now, in the ninth year of the program, we know that the greatest SO_2 emissions reductions were achieved in the highest SO_2-emitting States; acid deposition dramatically decreased over large areas of the eastern United States in the areas where they were most critically needed; trading did not cause geographic shifting of emissions or increases in localized pollution (hot spots); and the human health and environmental benefits were delivered broadly. The compliance flexibility and allowance trading has reduced compliance costs by 75 percent from initial EPA estimates.

[See 2001 Acid Rain Program Progress Report submitted for the record.]

It is clear from this example that existing regulatory tools often take considerable time to achieve significant results, and can be subject to additional years of litigation before significant emissions reductions are achieved. Under this scenario, there are few incentives to reduce emissions until rules are final and litigation is complete, posing potentially significant delays in achieving human health and environmental benefits.

The Clean Air Act contains several provisions under which EPA will be required to impose further emission controls on power plants in order to allow States to meet the new national ambient air quality standards (NAAQS) for $PM_{2.5}$ and ozone. For

example, Section 126 of the Clean Air Act provides a petition process that States can use to force EPA to issue regulations to reduce emissions of SO_2 and NOx from upwind sources, including power plants. A number of States have indicated that they intend to submit Section 126 petitions in the near future. However, compared to Clear Skies, this approach will almost certainly involve years of litigation and uncertainty about reduction targets and timetables.

Additional reductions are required from power plants through the regional haze rule's BART (Best Available Retrofit Technology) requirements and forthcoming mercury MACT (maximum achievable control technology) requirements. EPA is required to propose by the end of 2003 a MACT standard for utility mercury emissions that must be met, plant-by-plant, by every coal-fired utility with unit capacity above 25 megawatts. EPA is required to finalize this rule by the end of 2004. The Act generally gives sources 3 years within which to comply with MACT standards. This compliance obligation could be delayed by a court if EPA's rule is challenged.

Because these regulations will be the product of separate Federal, State and judicial processes, comparable health and environmental protection is likely to cost more under the current Clean Air Act than under Clear Skies. EPA estimates that a comprehensive, integrated approach relying on cap-and-trade programs could reduce costs by one fourth as compared to the regulatory approach achieving comparable emission reductions. These cost savings would be passed on to the public through lower electricity prices and greater profitability to investors and owners of electric generation.

New Source Review

Some have suggested that Clear Skies is an attempt to undermine the Clean Air Act. This is simply not true. To achieve the next generation of environmental progress, we must build on the successful provisions in laws that have served us well and learn from those provisions that have not served us well, or have had only limited success. New Source Review (NSR) is an example of a program that EPA and stakeholders have long recognized is not working well.

There is a misconception that the principle goal of the NSR program is to reduce emissions from power plants. This is simply incorrect. Reducing emissions from power plants is the principle goal of Clear Skies. The NSR program is triggered only when facilities emitting large amounts of air pollution are built, and when modifications at these facilities result in significant increases in air pollution. The NSR program is not designed to result in nationwide reductions of air pollution from power plants. When it comes to reducing harmful air emissions from power plants, Clear Skies would accomplish more than NSR.

Clear Skies would significantly modify the NSR program for power plants, but contain some important backstops. We expect that existing power plants would not have to go through NSR for modifications. New sources would no longer have to go through the entire NSR process, but some aspects of the process would still apply. Although we believe that with a tight cap on emissions, new sources will always install good controls, we did not want to run the risk that a new source would be uncontrolled. Therefore, as a backstop, Clear Skies would require all new power plants to meet New Source Performance Standards that are set in the statute.

In addition, new power generators locating within 50 km of a Class I area (e.g., national parks or wilderness areas) would still be subject to the current NSR requirements for the protection of those areas. Finally, new power plants will also have to meet the current NSR requirements that they will not cause or contribute to a violation of the national ambient air quality standards.

IV. WINDOW OF OPPORTUNITY

Because of the lessons learned over the last decade, there is increasing support for legislation such as Clear Skies that would significantly reduce and cap power plant emissions and create a market-based system to minimize control costs. From environmental groups to coal companies, there is increasing broad-based support demonstrating that multipollutant legislation is a preferable path to cleaner air. Such an approach would address an array of air pollution concerns associated with power generation—including fine particles, smog, mercury deposition, acid rain, nitrogen deposition, and visibility impairment—at lower cost and with more certainty than currently allowed by the Clean Air Act.

The Acid Rain Program is widely accepted as one of the most effective air pollution programs ever adopted and has consequently attracted worldwide attention and emulation. The Program's track record has encouraged Congress to consider broader applications of cap-and-trade programs to address multiple air pollutants. The common elements of the proposals considered by Congress are mandatory caps on emis-

sions of multiple pollutants from the power generation sector, implemented through allowance trading programs modeled after the Acid Rain Program.

There is no better time for Congress to be considering multipollutant legislation. President Bush has indicated that Clear Skies is his top environmental priority. The number of proposals being considered by Congress also indicates a consensus behind the basic idea of a multipollutant cap-and-trade approach. The Large Public Power Council, Edison Electric Institute, Adirondack Council, and numerous individual utilities have all expressed support for the scope and framework of Clear Skies. If legislation passes quickly, we will begin achieving emissions reductions and related health benefits now. Congress needs to act now so that we do not lose a decade's worth of health and environmental benefits from reducing fine PM pollution, smog, acid deposition, nitrogen deposition, and regional haze. Further, as EPA continues to implement additional forthcoming regulations under the existing framework of the Act, the likelihood of our ability to pursue an integrated program diminishes and with it diminish the numerous advantages that I have delineated today of an approach like Clear Skies.

Legislation is also needed now to help States with their air quality planning and provide incentives for industry innovation, which, in turn, would lower costs and emissions. Such incentives are particularly compelling this year as we approach the task of reducing mercury emissions from the power industry. If designed correctly, legislation could provide the incentive that spurs technological innovation. When stringent yet flexible mechanisms exist, substantial technological improvements and steady reductions in control costs can be expected to follow.

Congress obviously has much to consider as it weighs Clear Skies and other multipollutant proposals this year. We anticipate and welcome a rigorous and healthy debate on these issues.

RESPONSES OF HON. CHRISTINE TODD WHITMAN TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. In the last 4 years, has EPA performed any modeling or possess information which suggests that lower levels of emissions of SOx, NOx, and mercury, than would be achieved by implementation of the Clear Skies legislation are feasible and could be achieved with less than a $5 billion annual incremental cost beyond the cost of Clear Skies? If so, please provide the Committee with the data, including parsed model runs, and a summary of the data.

Response. During the development of the Clear Skies Act, the Administration looked at a number of policy options, analyzing air quality and economic impacts as well as the feasibility of installing the pollution controls necessary to comply with the environmental requirements. Last year, EPA provided to Congress model outputs, parsed model runs and summary data for each of the multi-pollutant scenarios that were analyzed for both air quality and economic impacts during the development of Clear Skies. EPA also provided the model outputs, parsed model runs and summary data for the economic and air quality analysis of Clear Skies that was done last year.

One of these modeling runs used during the development of Clear Skies is more stringent and has an incremental cost of less than $5 billion in annual costs. However, EPA's analysis of engineering, labor and capital markets for the power sector indicates that the ability of this sector to install the level of pollution controls required to meet the first phase requirements of this developmental scenario would significantly stretch the available labor resources beyond that which is feasible. This analysis raises concerns over the feasibility of requiring more pollution reduction than Clear Skies does in its first phase and/or installing controls sooner than the bill does. Notably, a program faced with a labor shortage would also be much more expensive, a consideration modeled in the work we supplied Congress. Additionally, we have found that the timing of the requirements in Clear Skies is an important part of ensuring the pollution controls can be financed. Enclosed are summary results of our engineering study and financial analysis of Clear Skies for your further consideration (Attachments 1 and 2).

Question 2. Please provide the Committee with any analysis, including parsed IPM runs and summaries, that the Agency has performed regarding S. 3135, the Clean Air Planning Act of 2002. The requested analysis does not need to represent the official Administration position, the Committee would like to receive whatever analysis EPA has performed using taxpayers dollars

Response. EPA analyzed S. 3135, the Clean Air Planning Act of 2002, using the Integrated Planning Model (IPM) for sulfur dioxide (SO_2), nitrogen oxides (NOx) and mercury emissions. EPA analyzed the CO_2 provisions in S. 3135 using an off-line

analysis that relied on the same methodology that EPA used in 2001 to respond to a request from Senators Smith, Voinovich and Brownback to analyze CO_2 components of various multi-emission power plant policy options. We have provided the modeling outputs and off-line spreadsheet analysis to your staff. EPA does not have parsed IPM runs for S. 3135.

Question 3. If I understood Mr. Holmstead's testimony correctly, he indicated that it is possible that there could be a 1.5 percent cost differential or somewhat more than that for implementation of S. 485 versus S. 3135, Senator Carper's bill. Please explain how larger emissions reductions, including carbon dioxide, could be accomplished with so little difference in cost.

Mr. Holmstead did not testify about the cost differential between S. 485 and S. 3135. However, EPA's analysis of S. 3135 projected annual costs at about $5.6 billion and $9.0 billion in 2010 and 2020, respectively. This is approximately 53 percent and 38 percent greater than the cost of Clear Skies for those same years (based on 2002 analyses).

Question 4. Please provide and compare a list of the assumptions used in the IPM models already run, or in the process of being run, specifically on the Clear Skies legislative proposal for three different periods: the period prior to introduction of S. 2815, the period prior to introduction of S. 485, and the period following introduction of S. 485.

Response. Extensive documentation regarding the Integrated Planning Model (IPM), including every model assumption, can be found on EPA's website (http://www.epa.gov/airmarkets/epa-ipm/index.html). For the year prior to introduction of S. 2815 until July 2003, EPA used modeling results from IPM V.2.1 to analyze the projected economic impacts of that bill. A copy of the main documentation report for that version of the model is enclosed (Attachment 3). Beginning in July 2003, EPA has used an updated version of the model in its analysis of S. 485, the Clear Skies Act of 2003. The documentation of this latest version of IPM (version 2.1.6) is also enclosed (Attachment 4). This documentation explains all the changes in the current version of IPM from the earlier version. A summary of all the changes can be found at the beginning of the document. Since introduction of S. 2815, IPM has undergone a routine update, and various IPM assumptions were revised. This version of IPM (V.2.1.6) was used to model S. 485 and continues to be used today. Documentation for the updated version of IPM can also be found on the website.

Question 5. The Clean Air Act Amendments of 1990 created strict attainment deadlines in Federal law because the States were having difficulty in controlling regional pollution and achieving healthy air. Why does the Clear Skies legislation propose to loosen and extend attainment deadlines, since that would assure that more people will live in areas with unhealthier air longer than required by the current Act?

Response. If enacted, Clear Skies would deliver early human health and environmental benefits almost immediately compared to the current Clean Air Act. Asserting otherwise shows a fundamental misunderstanding of how a cap and trade program works. The cap and trade program would provide incentives to start reducing emissions immediately. EPA projects that two-thirds of the counties currently out of attainment with the fine particle standards would come into attainment by 2010 as a result of Clear Skies, the proposed non-road heavy duty diesel rule, and existing State and Federal control programs. Without Clear Skies, only half of those counties are projected to attain in 2010 based on existing control programs and the non-road diesel rule.

Areas that are projected to meet the ozone and PM 2.5 standards by 2015 as a result of Clear Skies and other programs would have a legal deadline of 2015 for meeting these standards (i.e., will have an attainment date of 2015). These areas would be designated "transitional" areas.

Question 6. Would Clear Skies require additional legislation in the future to obtain greater reductions in mercury beyond the roughly 70 percent in 2018 (or later) mandated in the bill, even if good science indicates more aggressive action is needed to protect public health?

Response. Clear Skies would require approximately a 70 percent decrease in mercury emissions, as it does for SO_2 and NOx. It is an expansion of the acid rain trading program, and, as in the acid rain trading program, the Congress holds the sole power to adjust the caps. Due to the scientific and technological uncertainties regarding mercury, Section 410 of the Clear Skies Act would require a comprehensive assessment of the Phase II cap for mercury, along with those for SOx and NOx by 2009. This assessment is to include an examination of the latest scientific and technical information related to mercury effects, environmental chemistry, and control

approaches. Based on that assessment, the Administrator could submit any recommendations to Congress to revise the Phase II caps.

Question 7. Please provide a table comparing the proposed national emission standards for affected units in section 481 of S. 485 with the emissions performance required by permit for each new or modified—boiler or integrated gasification combine cycle plant, gas-fired combustion turbine, and any combustion turbine that is not gas-fired or coal-fired, for the last 5 years.

Response. The Clear Skies Act calls for significant reductions due to the two-phased caps. Thus, we believe that the section 481 values are redundant in the long run. The review of available limited permit data demonstrates a range of values both below and above levels set in section 481.

The EPA does not maintain a comprehensive record of the details of permit information for new and modified sources. Information is available on some, but not all, facilities receiving permits over the past 5 years. A partial compilation for new source permits for new or modified boilers, integrated gasification combine cycle plants, gas-fired combustion turbines, and combustion turbines is contained in the National Coal-Fired Utility Projects Spreadsheet. This compilation of information, supplied by all 10 EPA Regions, about new utility projects was updated in May 2003, and can be accessed at http://www.epa.gov/ttn/catc/products.html#misc.

Question 8 What are the average emission rates for NOx and SOx for new coal-fired power plants permitted over the last 5 years? What are the averages for modifications at existing coal-fired power plants permitted in the same period?

Response. In general the NSR program has been delegated to States, therefore EPA does not track all permit applications for new or modified coal plants. See question 7 for more details. Based on the permit information available, new coal plants have been permitted at NOx levels ranging from approximately 0.07 lbs/mmBtu to 0.15 lbs/mmBtu and SO_2 levels ranging from approximately 0.13 lbs/mmBtu to 0.30 lbs/mmBtu. We do not have comparable information on permits for modifications at existing power plants.

Question 9 Does EPA disagree with the Abt Associates peer-reviewed study done a couple of years ago which estimates about 30,000 people are dying prematurely every year right now from power plant pollution? If so, why?

Response. EPA agrees that fine particle pollution contributes to premature deaths as well as other serious health effects. That is why this Administration is seeking the fastest method for achieving air quality improvements over the next decade. EPA has not analyzed the total number of premature deaths attributable each year to fine particle pollution, or the total contribution of a particular sector to health effects associated with air pollution. Instead of calculating total premature deaths from fine particles, EPA'S analyses have focused on quantifying the incremental benefits of adopting particular regulatory strategies. In 1995, EPA projected the human health benefits of Title IV of the Clean Air Act (the Acid Rain Program). That analysis suggested that, by 2010, the Title IV program alone would prevent approximately 10,000 premature deaths each year. While the Acid Rain program has been very successful in reducing harmful emissions from utilities, Clear Skies will provide even further health protection. We have estimated that Clear Skies reductions by 2020 could prolong as many as 14,100 lives annually (while an alternative approach would set this figure at 8,400 lives prolonged annually.)

Question 10. In a recent EPA briefing on Clear Skies for Senate staff, an Agency presenter admitted that mercury reductions would be greater in 2008 under the mercury MACT rule than under Clear Skies. Please explain how Clear Skies mercury controls would not lead to an increased health risk to newborns and pregnant women, compared to completely carrying out the mercury MACT standards.

Response. Thank you for the opportunity to clarify this much-discussed issue. The utility MACT rulemaking process and the underlying analyses are not yet completed, and therefore we cannot state definitively whether the ultimate mercury emission reductions under MACT would be greater or less than those that would be achieved under Clear Skies.

After the proposed rule is published in December, 2003, the Agency will assess the public comments submitted before publishing the final rule in December, 2004. The statute requires compliance 3 years following promulgation (i.e., December, 2007), although States have the ability to delay the requirement for a year (i.e., until December, 2008). While the statutory timing for the implementation of the utility MACT is prior to the Clear Skies' Phase I cap date, it is almost certain that the utility MACT will be litigated. Therefore, the timing is highly uncertain.

In contrast, under Clear Skies we believe that mercury emission reductions will begin as soon as Clear Skies is enacted because the cap-and-trade system provides firms certainty in their business planning and an incentive to bank allowances in

the early years of the program. What's more, since Clear Skies is a multi-pollutant approach to emissions reductions, some mercury reductions will be achieved as a co-benefit from the installation of SO_2 and NOx controls. Clear Skies will therefore likely result in earlier emissions reductions than the MACT rule, reducing the health risk to newborns and expectant mothers sooner than MACT.

Question 11. Does Clear Skies eliminate the residual risk provisions of Section 112 with respect to mercury and electric utilities? Also, would these statutory provisions be eliminated or deferred for other hazardous air pollutants under the Clear Skies legislation? Please justify.

Response. Under the Clear Skies Act of 2003 (CSA), the Administrator would conduct a comprehensive assessment of the Phase II caps pursuant to section 410 (Evaluation of Limitations) and then recommend to Congress whether changes to the Phase II caps are appropriate. This evaluation and possible recommendation and the required reduction in mercury emissions make the provisions of section 112(f) of the Clean Air Act as they apply to mercury from electric utility generating units unnecessary. However, the section 112(f) provisions for hazardous air pollutants other than mercury, would remain in effect under the Clear Skies Act of 2003.

Clear Skies logically modifies the deadlines for addressing residual risk from non-mercury hazardous air pollutants from the power sector to run from the start of the allowance requirement of section 472 rather than within 8 years of issuance of a MACT standard under the current provisions of the Clean Air Act. This modification will allow EPA to have sufficient emissions and exposure data after SO_2 and NOx allowance compliance strategies are in place to make the necessary determination of the need for a residual risk standard for these non-mercury hazardous air pollutants.

Question 12. Please explain how Clear Skies will achieve greater reductions in 2018 in mercury emissions than would be achieved by MACT requirements in the present law.

Response. EPA entered a settlement agreement to propose the Utility MACT in December, 2003, after which the Agency will consider public comments submitted on the proposal and issue a final rule in December, 2004. Until the entire rule-making process is complete, it is not possible to determine whether the CSA would obtain mercury reductions greater than or less than the Utility MACT. We can be fairly certain, however, that Clear Skies will achieve reductions sooner than would be achieved under MACT. Due to Clear Skies' incentives for early reductions, reductions would start occurring as soon as the legislation passed. With MACT, the final rule won't be issued for another 15 months, and then with litigation uncertainties, it is impossible to know when emissions reductions might begin.

Question 13. As I understand it, the National Park Service, Federal land managers, and EPA have documented that air pollution degrading visibility and causing acid deposition in the National Parks and Wildlife Refuges is coming from power plants many miles away, sometimes more than 50 or 100 miles away. For example, dozens of power plants impact the Smoky Mountains National Park, but only one falls within the 31 mile/50 kilometer perimeter of the park. That's the limit contained in the Clear Skies proposal for use as a test to determine whether better control technology is required. Would Clear Skies allow new power plants to be sited or old ones reconstructed in places that could degrade visibility or cause increased deposition in the National Parks?

Response. Clear Skies would require individual new facilities to have, at a minimum, modern pollution controls as specified in section 481 (National Emission Standards for Affected Units) of the Clear Skies Act. Subsequent review by the Federal Land Manger of facilities within the 50km limit would ensure that the potential impacts of well controlled new sources do not result in significant local effects in Class I areas.

Clear Skies would benefit the ecosystems and air quality in national parks across the country, especially in the eastern States. The reductions in acid rain, eutrophication, mercury deposition and regional haze from Clear Skies would improve these treasured resources. By addressing air pollution from a regional perspective, the transport of air pollution into national parks and wilderness areas would be reduced.

An examination of our emissions projections for the Class I area in your question—the Great Smoky Mountain National Park (GSMNP)—serves to illustrate the strength of the Clear Skies approach to these issues. Using air quality modeling approaches in our 2003 analysis, we forecasted emissions with and without Clear Skies for the GSMNP air shed, which stretches over several hundred kilometers in the eastern US. There are substantial overall reductions in SO_2 and NOx emissions affecting this air shed as compared to the base case that EPA modeled (which as-

sumes continued implementation of existing control programs, but no new Federal or State regulatory control programs). Under the base Case, EPA projects that emissions of SO_2 in the Southern Blue Ridge Airsheds that encompass the GSMNP will be approximately 5 million tons in 2020. Clear Skies will drop these acid rain-causing pollutants to less than 2 million tons in 2020.

NOx emissions will also drop dramatically under Clear Skies. We project that Clear Skies will reduce emissions of NOx in these airsheds from approximately 1 million tons in the 2020 base case down to approximately 200,000 tons in 2020. We believe that Clear Skies will result in approximately $600 million of benefits in the Great Smokies in 2010 and $2 billion of benefits in the Great Smokies in 2020. And, this figure does not include the many benefits for which we cannot assign a monetary value. These projected improvements include all forecasted growth in new sources. Clear Skies would provide the regional reductions necessary to improve visibility and ecosystem protection of our National Parks and Wilderness areas.

Question 14. What measurable effects will Clear Skies have on episodically acidic lakes and streams in the U.S.?

Response. When analyzing the effects of Clear Skies on lakes and streams, EPA focused on the Northeast and the Southeast the areas of the country with most acid-sensitive aquatic ecosystems. The results of our 2003 analysis are presented below.

From this analysis, we found a small improvement in reducing the percentage of southeastern streams that are episodically acidic. This is primarily due to the long period of time that Southeastern soils hold decades of acid loadings that continue to be released, even as loadings are reduced. Thus, in the Southeast, Clear Skies would slow the deterioration of stream health expected under the Base Case and would prevent additional streams from becoming chronically acidic. In the Northeast, there is an initial appearance of a perverse effect of more lakes characterized as episodically acidic, but actually most of these lakes have shifted from the more serious chronically acidic category to episodically acidic. In fact, Clear Skies is projected to eliminate chronic acidity in Adirondack region lakes, whereas more than 1 in 10 is chronically acidic in the Base Case in 2020.

Question 15. How will conformity work in the transitional areas proposed to be created in Clear Skies?

Response. Under the Clear Skies Act, transportation conformity (dealing with highways and mass transit) and general conformity (dealing with all other Federal actions) would not apply to areas designated as transitional for a specific pollutant (for example, ozone or particulate matter), since these areas would not be designated as nonattainment for that pollutant. Conformity requirements would apply only in nonattainment and maintenance areas. If an area is designated transitional for one pollutant and nonattainment for another pollutant, then conformity would apply for the nonattainment pollutant but not for the transitional pollutant. This approach is based on the common-sense principle that we should not require local areas to adopt local measures if their air quality problem will be solved in a reasonable timeframe by the reductions in power plant emissions required by Clear Skies.

Question 16. If the pending NSR enforcement actions against power plants were all decided in EPA's favor, the targeted facilities would make significant reductions of SOx and NOx. Under the models run for Clear Skies, how much would each of these targeted plants probably reduce annual emissions compared to the reductions they would make if the NSR enforcement actions were decided in EPA's favor?

Response. Because many of the enforcement actions are on-going, EPA is unable to estimate the emission reductions that would be obtained at all of the plants currently subject to enforcement action. Furthermore, the enforcement actions that have been settled have resulted in a range of reductions and timing, making the outcome of future cases difficult to project. Aggregate emissions from the power sector under Clear Skies would be reduced by 70 percent beyond today's emission levels. Under Clear Skies, total emissions are capped at this 70 percent reduction level indefinitely. NSR enforcement does not provide you with that guarantee because even if you have the most stringent standard at every plant, if the number of plants keeps growing, the amount of emissions can grow as well.

Question 17. What would be the approximate emissions performance for NOx and SOx for each of the power plants covered by the Agency's NSR enforcement actions if all the cases were decided in EPA's favor?

Response. See answer to Question 16.

Question 18. If all power plants defined as "affected units" under Clear Skies were required to apply BACT for the relevant technology and fuel source today, what would be the total NOx and SOx emissions from those sources?

Response. EPA has not performed this analysis of emission reductions. But command and control regulations (such as BACT) have consistently been shown to be

far more costly at achieving a given emission reduction target than a cap and trade approach (such as Clear Skies).

Question 19. Administration witnesses have testified, and the Agency's 90-day report on NSR, indicate that the application of NSR to new sources works well and effectively. Why is it necessary in Clear Skies to eliminate it or replace it with something else?

Response. Given the tight caps and the backstop of technology standards for new power plants, we believe that the significant governmental and industry resources involved in the NSR program would no longer be needed for power plants if Clear Skies were to pass. The Clear Skies legislation provides clear advantages over the NSR program. The caps in Clear Skies guarantee emissions are capped indefinitely; under NSR total emissions can still increase. The market-based mechanisms in Clear Skies allow firms the most flexibility to reduce emissions at the lowest cost possible. The program has inherent incentives for firms to begin reducing emissions early. The administrative burden of Clear Skies is much lower than that of NSR. Clear Skies provides the regulatory certainty that plant managers need when planning for the future. The tight caps in Clear Skies would provide an increasing economic incentive for new sources, as well as existing sources, to install good pollution controls.

The caps would also provide economic incentives to drive technological innovations. To ensure that new power plants put on good controls in the early years of the program, Clear Skies also sets technology-based standards that new sources would be required to meet. Clear Skies also maintains protections for Class I areas from power plants locating within 50 km of their boundaries. States are still required to ensure that constructions of new sources are consistent with plans for attaining the applicable National Ambient Air Quality Standards. Protection for other local concerns can still be addressed by State programs because Clear Skies does not preempt State authority to impose more stringent controls.

Question 20. According to current EPA material, in 2010, Clear Skies would bring 34 counties into attainment for the fine particle standard and 10 counties into attainment for the ozone standard. According to EPA, the existing schedule under the Clean Air Act will require areas to achieve attainment by 2009. Based on EPA modeling, how many counties will not be in attainment in 2010 for either the $PM_{2.5}$ or the ozone NAAQS primarily because of power plant emissions and how many people will be living in them?

Response. Our most recent analysis projected that, in 2010, Clear Skies would bring an additional 42 counties into attainment for the fine particle standard and an additional 3 counties into attainment for the 8-hour ozone standard beyond the number projected under the Base Case (i.e., existing control programs plus the proposed non-road diesel rule). Absent additional State or Federal regulation, 124 counties nationwide (with a population of 77.1 million people) would have monitoring data showing that they were not attaining one or both of these standards in 2010. This widespread non-attainment cannot wholly be attributed to any single source category, but it is likely that the power generation and mobile sectors play a dominant role in most locations.

Our current model results do not allow us to quantify the contribution of power plant emissions to nonattainment. But given that power plants are responsible for about two-thirds of the emissions inventory for SO_2 and about one-fifth for NOx, and that large portions of nonattainment are due to regional transport, it is clear that power generation plays a significant role in projected nonattainment throughout the eastern 35 States and DC. For this part of the country, absent additional State or Federal regulation, 109 counties (with a population of 53.9 million people) would have monitoring data showing that they were not in attainment with one or both of these standards.

Question 21. Since Clear Skies eliminates the final MACT standard for mercury, what provisions in the Administration proposal will ensure that toxic hot spots do not result from using a cap-and-trade system for mercury emissions?

Response. Clear Skies would reduce nationwide mercury emissions by 70 percent from current levels. As occurred under the Acid Rain Program, and as the Clear Skies modeling indicates, under a cap-and-trade system the largest emission reductions tend to take place in the areas with the largest emissions. Therefore, sources with the most mercury emissions are expected to reduce emissions the most. The Administration proposal is not expected to create areas of increased mercury deposition. Additionally, if a State decides that local conditions warrant, it can impose more stringent controls.

Question 22. If the Administration is certain that Clear Skies will be helpful in achieving attainment on schedule, then why is it necessary in that legislation to de-

lete (or diminish) State authorities such as section 126 that are intended to assure attainment?

Response. We believe that the first phase reductions in NOx, SOx and Hg in Clear Skies would push the power generation sector about as far and fast as is technically and economically feasible. The cumulative reductions from Clear Skies would be greater over the next decade than would be likely under current CAA authorities, including section 126.

Question 23. EPA's estimates say that in 20 years Clear Skies would leave the Smokies with more than 2.5 times the amount of nitrogen deposition than would allow recovery of the ecosystem. When would recovery of the Smokies ecosystem occur under Clear Skies?

Response. EPA's 2003 analysis shows that in 20 years, Clear Skies will reduce nitrogen deposition in the Smokies region between five and 20 percent. The Agency believes this would help the area's acid-sensitive streams and nitrogen-sensitive forests recover. However, we are technically unable to model the environmental benefits of this reduction in nitrogen deposition at this time.

Question 24. Does the public and do companies' shareholders have a right to know about air emissions that may cause long-term damage like greenhouse gases?

Response. The Agency takes seriously its role to provide quality data to the public and the scientific community. Greenhouse gas (GHG) information is provided in several of EPA outreach initiatives, reports, and on-line sources. For the power sector specifically, in EPA's annual Emission Scorecard we publish plant-level emissions data for SO_2, NOx and CO_2 from the Acid Rain Program reported to us as required under section 821 of the Clean Air Act Amendments. Another EPA product, E-Grid, provides a data base of plant-level emissions that is designed to be highly user-friendly (www.epa.gov/cleanenergy/egrid). Finally, the US GHG Emission and Sinks Report, published every April, is another source of information on aggregate GHG emissions for those seeking information on emissions data for economic sectors of interest. Copies of EPA's latest Emissions Scorecard and GHG Emissions and Sinks Report are enclosed (Attachments 5 and 6).

Other agencies are also working to make sure that greenhouse gas emissions information is readily available to the public. The Department of Energy has maintained a voluntary registry for emissions reductions since 1997. In 2001, 228 participants in 25 different industries or services reported 1,705 projects to the registry. The DOE is currently working with a large interagency team, of which EPA is an active participant to improve this registry, per President's Bush's February 2002 directive. The Energy Information Administration's annual US inventory of GHG emissions (published as required by section 1605(a) of the Energy Policy Act of 1992) is available at http://www.eia.doe.gov/oiaf/1605/ggrpt/index.html

Question 25. Under Clear Skies legislation if enacted, would States be able to retain their existing NSR programs for application to electric power plants? If so, would a State be eligible for SIP credits if the application of that States NSR program resulted in more stringent requirements for power plants than are required under Clear Skies?

Response. Yes, States would have the option of retaining their existing NSR programs as they apply to electric power plants. Nothing in the Clear Skies legislation would preempt existing State authority in this regard. Moreover, there is nothing in Clear Skies that would prohibit a State from receiving proper credit in its ozone or other attainment demonstration for any State Implementation Plan requirements beyond Clear Skies.

Question 26. Your testimony says that the new transitional areas allowed under Clear Skies would have a legal deadline of 2015 to meet the national air quality standards. But, the legislation says that EPA will review their attainment status by the middle of 2016, and if they're in nonattainment, then sometime in the next 4 years the area must submit a revised SIP. So it appears an area could easily get an extra four or 5 years until 2021 before they have to adopt actual controls. Do the current laws attainment deadlines have to be extended 6 to 10 years because the caps in Clear Skies are too weak and too late?

Response. Clear Skies creates a transitional designation for those areas that, based on modeling done after Clear Skies, are projected to come into attainment with the power plant reductions from Clear Skies and other Federal measures. In addition, if Clear Skies is projected to improve an areas air quality, but not enough to bring it into attainment, those areas can be designated transitional if, by the end of 2004, the State submits and EPA approves additional local measures and a demonstration that those local measures will bring the area into attainment by 2015. If an area does not meet the criteria for transitional classification, then the attainment date will be governed by the existing Clean Air Act.

The only areas that would be eligible for a 2015 attainment date are those that have a combination of Federal and local measures that are projected to bring them into attainment. Although the legal deadline for attaining the ozone and PM2.5 NAAQS would be 2015 for these transitional areas, as a practical matter, we expect many of these areas to attain prior to 2015.

The provisions specifying what happens if an area does not attain by 2015 have been created as a backstop in case actual circumstances and monitoring do not match the modeling projections. These provisions are similar to the current provision of the Act contained in section 179(d) of the Clean Air Act, which requires a State with an area that does not attain the standard by the legal deadline to submit another State Implementation Plan to EPA within 1 year.

Question 27. According to your testimony, when Clear Skies is fully implemented, 85 percent of the coal-generated power will be from facilities that will have advanced pollution control technology in both the east and west. Please identify those facilities that will not have advanced pollution control technology and the approximate share of the total emissions inventory for each pollutant that they will as a group represent.

Response. The facilities that IPM projects to install advanced pollution control technology can be identified using the IPM parsed output files available on our website (http://www.epa.gov/airmarkets/epa-ipm/results2003.html). This website includes an explanation of the various types of pollution controls that sources may install in the model to meet the caps under Clear Skies, with additional details are provided in the documentation (refer to QJ4). Notably, facilities that have "advanced pollution control technology" for SO_2, NOx and/or mercury are using scrubbers, SCRs and activated carbon injection, respectively. Virtually all coal-fired units control particulates through highly effective electrostatic precipitators or baghouses. If these units do not also have the above advanced controls, they are called "uncontrolled" for SO_2, NOx and mercury. After the implementation of the Clear Skies Act, the uncontrolled coal-fired plants are projected to emit just under 1.7 million tons of SO_2 (out of 4.26 million tons for all coal sources), 640 thousand tons of NOx (out of 1.5 million tons for all coal sources), and 7.2 tons of mercury (out of 22.2 tons for all coal sources). It is important to note that IPM best predicts the types of units making changes and is not able to accurately predict every unit's future situation, even though the parsed runs show individual units that do not install these advanced controls. Results generally show that smaller, old, less efficient units that are less likely to have advanced controls.

Question 28. When Clear Skies is fully implemented, will any coal-fired power plant operate without pollution controls?

Response. Under the Clear Skies Act of 2003, by 2020, about 80 percent of coal-fired capacity will come from plants with advanced pollution controls (scrubbers, SCR and/or activated carbon injection). We expect more controls to be installed after 2020, but believe that the extent of additional controls is subject to a great deal of uncertainty. As noted previously, almost all power plants operate with technology to control particles. However, as with other multi-pollutant policy options using a cap-and-trade, market approach (as well as under the current Clean Air Act acid rain provisions), some coal-fired sources would operate without "advanced pollution controls" as we have defined them (See QJ27), where lower cost emissions reductions are available from other facilities and emission allowances are purchased to meet compliance needs. Clear Skies modeling, which takes into account that some sources may operate without advanced pollution controls, still shows substantial benefits from Clear Skies implementation throughout the country and widespread advanced pollution controls in place.

Question 29. What are the current emissions characteristics of the coal gasification combined cycle power plants in the U.S., and at any of those abroad for which EPA has data?

Response. There are two coal gasification combined cycle (IGCC) units in the country. One is Tampa Electric Company's Polk Power Station Unit #1 IGCC Power Plant, a 250 MW unit that is located near Tampa, FL. The other is PSI Energy's Wabash River Generating Station Unit #1, a 262 MW plant in West Terre Haute, IN.

Using data in EPA's Emissions Scorecard 2001 (which includes emissions data for power plants in the Acid Rain Program—see www.epa.gov/airmarkets/emissions/score01/index.html), the following emissions data is provided for year 2001:

Polk unit: SO_2 emissions 0.15 lbs/mmBtu

NOx emissions 0.10 lbs/mmBtu

Wabash River unit: SO_2 emissions 0.14 lbs/mmBtu

NOx emissions 0.17 lbs/mmBtu

Mercury emissions estimates for these plants in 1999 (based on 1999 EPA Mercury ICR data):

Polk unit: 61.9 lbs/yr

Wabash: 133.6lbs/yr

EPA does not have data for overseas coal gasification plants.

Question 30. The NOx SIP Call starts reductions in May 2004. Why does the Clear Skies NOx cap start in 2008, rather than 2010, as the caps do for SOx and mercury?

Response. Sources are largely expected to meet the Phase I NOx requirements of Clear Skies by expanding their utilization of existing control equipment (equipment that has been, or will be, installed in response to regional NOx reduction programs such as the NOx SIP call) from the 5 month ozone season to year round. In contrast, EPA analysis projects that it would be necessary for sources to install additional control technology to meet the SO_2 and Hg caps of Clear Skies. As a result, it is possible to begin the NOx reductions of Clear Skies earlier, because the potential for straining the capital, labor, and equipment markets for control equipment construction is lower than it would be for SO_2 and Hg emissions. In addition, the NOx reductions of Clear Skies are needed earlier than those of SO_2 and Hg in order to meet the ozone attainment deadlines, which occur earlier than those for particulate matter.

It is important to note that Clear Skies provides incentives for early reductions, so it is likely that plants will begin reducing emissions soon after the passage of the legislation. In contrast, compliance with the NOx SIP call was prolonged by a lengthy rulemaking process and lawsuits postponing implementation until 6 years after the rule was finalized.

Question 31. In EPA'S written testimony, it says that the legislation will still require new power plants to meet the current NSR requirements that they will not cause or contribute to a violation of the NAAQS. However, the legislation actually says that the source must demonstrate that the emissions increase from the unit will not cause, or contribute to, air pollution in excess of any NAAQS. That's a different standard. Why is it necessary to change the existing test in law?

Response. EPA did not intend to suggest in its written testimony that the Clear Skies legislation would result in a change to the existing test for determining whether a new source would cause or contribute to a violation of the NAAQS. EPA does not believe that this language in the Clear Skies Act would be interpreted in our implementation, or by a court, as setting a different standard than do the current NSR requirements.

Question 32. Are there any electric generating units in the US that have never installed pollution control equipment through the New Source Review process? If so, please identify those facilities.

Response. Yes, there are electric generating units in the US that have never installed pollution control equipment through the New Source Review (NSR) program. EPA does not have a comprehensive listing of which power plants have installed control equipment as a result of this programs. Because there are multiple programs that may apply to a particular plant—with New Source Review (NSR) requirements applying only to new (or certain modified) sources—we are unable to attribute a particular installation of a control technology to any one program.

While some power plants control their emissions using advanced SO_2 or NOx pollution control equipment (i.e., end-of-the-stack equipment), many do not. Some plants have not been subject to a regulatory program that requires the installation of specific technology or sets a performance standard. Others have been subject to a program, like the Acid Rain Program, which allows flexibility in choosing the most cost effective compliance strategy (e.g. add-on controls, fuel switching, efficiency improvements). Of those plants that operate with advanced pollution control devices, many installed that equipment for reasons other than NSR requirements. Unit level information on NOx and SO_2 controls for Acid Rain units can be found in Appendix B at: www.epa.gov/airmarkets/emissions/score01/index.html

Question 33. Under current law, areas will need to attain for the fine particulate matter standard by 2009, or they could, under certain limited circumstances get an extension to 2014. According to a scenario in the 1997 impact assessment to accompany the $PM_{2.5}$ NAAQS, getting close to attainment using power plant reductions would require 60 percent reduction in SOx emission from those sources. In what year would Clear Skies likely reach a 60 percent reduction in SOx emissions from power plants?

Response. In the 1997 assessment which accompanied the revision of the PM NAAQS, the analysis provided a broad implementation scenario for the purpose of projecting both the costs and benefits of alternative NAAQS levels. In this analysis,

EPA assumed that implementation of the new fine particle NAAQS would lead to an initial reduction of SOx emissions from the electric power industry by lowering the SOx emissions caps under the Title IV trading and banking program in order to reduce the formation of sulfate particles. In one scenario, the Agency assumed that power plant SOx emissions would be reduced by 60 percent to 3.58 million tons. Under Clear Skies, power plants emissions are capped at a lower level of 3 million tons in 2018. Due to the ability to bank early reductions under Clear Skies, this emissions cap is projected to be achieved after the 2020 time period, but this is only because emissions would be lower than the permissible cap level in the early years of the program.

Just to clarify, if all areas are designated non-attainment by the end of 2004, areas will have an attainment date no later than 2009, with possible extensions to 2014. In certain circumstances, areas can be given two additional 1-year extensions to meet the standard.

Question 34. What is the impact on the zone 2 States of the addition of Kansas and Oklahoma? Please justify the inclusion of these States in zone 2. What is the impact of the change on non-attainment in areas east of these two States?

Response. By placing Kansas and Oklahoma under the Zone 2 NOx emissions cap, the effective NOx emission rate will change slightly from 0.24 lbs/mmBtu to 0.21 lbs/mmBtu in 2020. Different control levels are appropriate in the eastern and western sections of the country because each faces different types of environmental problems. NOx reductions in the East are needed to address ozone and fine particulate matter nonattainment issues, as well as acid rain and eutrophication of water bodies. NOx reductions in the West are primarily aimed at improving visibility in national parks and ensuring that the West continues to meet ozone and fine particulate matter standards. (The exception is California which has some counties currently in non-attainment.) Kansas and Oklahoma were grouped with the western States because they are not believed to be significant contributors to nonattainment in eastern States.

Question 35. Please submit the cost-benefit analysis that EPA has performed on a proposal that has been described to the Committee: a 2 million ton cap on sulfur dioxide emissions by 2013. Please describe in detail the costs and benefits of this target and timetable, and include a comparison of costs and benefits of this alternative with the costs and benefits of the SOx target and timetable included in the Clear Skies Act.

Response. Over the last 2 years, EPA has focused on analysis of strategies to reduce SO_2, NOx, and mercury emissions and not strategies addressing a single pollutant, especially in the more detailed analyses that have been done. Cost-benefit analyses of multi-pollutant approaches limiting emissions from power plants require specification of the cap levels and deadlines for all pollutants.

Although during the development of the Clear Skies Initiative EPA performed a preliminary analysis of a multi-pollutant scenario in which the SO_2 cap of 2.25 million tons in 2010 was specified (along with caps for NOx and mercury) for use in internal Administration discussions, we have not performed an analysis of a standalone 2 million ton SO_2 cap. As explained in QJ1, however, there were several feasibility concerns raised by seeking such stringent reductions in the first phase of a multipollutant program.

Question 36. Under Clear Skies, it seems possible that the new so-called transitional areas allowed in the proposed legislation would have until 2020 before they would need to have a SIP adopted and implemented. That's well after the 2009 or 2010 attainment date that the Act requires following designation. Under S. 485, what's the latest possible date at which a transitional area would be absolutely required to have a SIP adopted demonstrating attainment?

Response. SIPs are meant to contain those State control measures that are necessary to bring an area into attainment based on projections of future air quality and economic activity. If EPA modeling projects that transitional areas come into attainment with Federal control measures and State control measures that are already adopted, then there is no need to have additional State control measures to bring the area into attainment, and thus nothing new is required for an approvable SIP.

Under Clear Skies, if an area that is forecast to attain the standard does not do so by the end of 2015, it then would be required to be designated as nonattainment and to submit a SIP demonstrating attainment no later than June 2020. The process for these areas is similar to that under the existing CAA section 179(d) provision for areas that fail to attain the standard by their attainment dates.

For additional information on transitional areas, please see the answer to Question 26.

Question 37. Is it accurate to say that low-income families and the elderly, who generally have less access to health care, suffer disproportionate harm from ambient air pollution? If so, what does the Agency's estimate is the aggregate and per capita quantified harm experienced by this population from ambient air pollution?

Response. Certain groups may be more susceptible to harm from ambient air pollution. Older people are especially vulnerable to air pollution because (1) the immune system weakens with age, (2) chronic conditions (e.g., chronic bronchitis or heart attacks) may be more likely to develop in those who have experienced a lifetime of elevated exposure, and (3) older people are more likely to have pre-existing heart and lung conditions that may be exacerbated by elevated short-term exposures to fine particles and ozone.

To the extent that individuals with lower incomes experience higher rates of some cardiovascular and respiratory diseases than other groups, they may experience more adverse effects, as exposure to air pollution can exacerbate these existing conditions.

EPA has not analyzed the per capita number of premature deaths or other health impacts attributable each year to ambient air pollution for the entire population or for certain subpopulations. Rather, EPA has focused on quantifying the benefits of adopting particular regulatory strategies. This gives us an indication of the potential magnitude of the benefits that could be achieved by reducing air pollution under a given regulatory strategy. For example, EPA's analysis of the benefits of the 2003 Clear Skies Act projects substantial benefits for older Americans. By 2020, Clear Skies would prevent 14,100 premature deaths each year. (An alternative methodology for calculating health benefits projects approximately 8,400 premature deaths prevented each year). In addition, EPA projected that each year, by 2020, Americans would also experience approximately 30,000 fewer visits to hospitals and emergency rooms, 23,000 fewer non-fatal heart attacks, and 8,800 fewer cases of chronic bronchitis. Many of these benefits would accrue to older Americans.

EPA has not apportioned the benefits of Clear Skies or other regulatory strategies to people of different income classifications. We do not have an example of the magnitude of benefits that could be achieved by reducing air pollution for low-income families.

Question 38. Please compare the reductions in total tons of sulfur dioxides and nitrogen oxides emissions required by the Clean Air Act Amendments of 1990 from 1990 to 2010 and those required under the Clear Skies legislation from 2004 to 2024.

The CAA amendments of 1990 achieved considerable reductions from the power sector. EPA's data and analysis suggests that SO_2 emissions will have gone from 15.7 million tons in 1990 to roughly 9.7 million tons in 2010, achieving a reduction of 38 percent. Some of the SO_2 reductions are attributable to various State rules. For NOx, emissions will have gone from 6.7 million tons in 1990 to 3.9 million tons in 2010 (42 percent reduction). NOx reductions are attributable to the amendments of 1990, the NOx SIP call, the OTC trading program, and various State rules.

With Clear Skies, reductions of SO_2 and NOx for the first 2 decades after enactment would be even greater than those projected to be achieved from 1990 through 2010. From 2000 to 2020, EPA projects that, with Clear Skies, SO_2 emissions would decrease by 62 percent (from 11.2 to 4.2 million tons) and NOx emissions would decrease by 66 percent (from 5.1 to 1.7 million tons). In addition, mercury emissions would decrease by 54 percent (from 48 to 22 tons). Ultimately, Clear Skies will reduce annual emissions of these three pollutants by an average of 70 percent. It is difficult to calculate the reductions in total tons of SO_2 and NOx because of the difficulty in determining what emissions would have been in the absence of Title IV and what they will be in under the Clean Air Act in the absence of Clear Skies.

Question 39. In testimony, Mr. Holmstead said that the Agency thinks that under Clear Skies there will be less fuel-switching, from coal to natural gas, than under the current Clean Air Act. How much fuel switching does the Administration project will occur between now and 2020 if there are no statutory changes in the Clean Air Act?

Response. Past EPA analysis indicates that industry makes different compliance strategy decisions when all emission reduction requirements are known up front, as with Clear Skies. This contrasts to situations when the requirements are identified over time and compliance with some is required before all are specified, as under the current Act. EPA performed an analysis of a hypothetical "business-as-usual" case that was similar to the Straw Proposal EPA was evaluating in Fall 2001 in order to show this comparison. This past analysis indicated that fuel switching is a more likely compliance option when industry learns the specifics of requirements over time rather than up-front, even when control requirements are similar. Uncertainties created by litigation even further complicate the second scenario.

Thus, compared to Clear Skies, EPA's full implementation of the current CAA will likely result in considerably greater disruption to industry including additional fuel switching and a more substantive impact on gas consumption and prices—due to the less efficient, piecemeal approach to these regulations (e.g., MACT, NSR, BART, and other efforts to achieve the NAAQS). However, EPA cannot predict how much fuel switching would occur under the current Act because that would depend on the specific requirements the industry will face, which are dependent upon numerous State and Federal rulemakings that have not yet been completed and are not possible to reliably predict (the above mentioned analysis was meant to be illustrative of the drawbacks of sequential rulemaking and never intended to represent how EPA and States would implement the existing Clean Air Act).

Question 40. Please describe how, if at all, Clear Skies provides a market incentive for owners or operators of fossil-fuel power plants to—1) increase their efficiency (MmBtu input per MWh output), 2) invest in the development and siting of coal gasification combined cycle plants in the next 20 years.

Response. The cap-and-trade approach of Clear Skies inherently encourages fuel efficiency, including investment in new generation technologies that are more efficient than their predecessors. A plant that can create a marketable product, such as electricity, steam, or hydrogen, using less fuel, will produce less pollution for a given quantity of product. As a result this efficient plant will have to retire less (or purchase fewer) emission allowances a valuable commodity for a given amount of product. Clear Skies makes it more expensive to emit NOx, SO_2, and Hg, thereby making more efficient plants, such as IGCCs, more economically competitive.

Question 41. Do you believe that the current statutory language or the consent decree regarding the MACT requirements for hazardous air pollutants could result in a rule that controls mercury only at the co-benefits level—in the 40–50 percent range per unit?

Response. The current statutory language regarding mercury emissions from coal-fired electric utility units defines existing source MACT to be". . . the average emission limitation achieved by the best performing 12 percent of the existing sources (for which the Administrator has emissions information) . . ." There is no language in the settlement agreement that would change this statutory direction. At the current time, any appropriate subcategorization scheme and the assessment of the individual floors for the MACT proposal have not been completed. Moreover, after the utility MACT rule is proposed in December, 2003, EPA will evaluate public comments submitted in response to the proposal before finalizing the rule in December, 2004. Thus, it is premature to speculate whether the Utility MACT standard would impose controls more or less stringent than achieved as a co-benefit provided by imposing reductions of other pollutants.

Question 42. Please explain how the alternative methodology for presenting quantified benefits of Clear Skies (i.e. $11 billion in 2020) complies with the Agency's data quality guidelines under the Data Quality Act.

Response. The purpose of the alternative methodology was to explore how sensitive EPA's main analytic conclusions (that the benefits outweigh the costs) were to changes in scientific and economic assumptions in the estimate of the Clear Skies approach. This type of sensitivity analysis is fundamental to sound and comprehensive analysis of major environmental issues. Notably, we have found that even with these alternative assumptions for key variables, the benefits outweigh the costs. EPA's report on its analysis of the Clear Skies approach summarized the foundation for this alternative estimate. EPA's data quality guidelines were still being developed at the time the Clear Skies analysis was completed, but conducting this type of sensitivity analysis would not have been inconsistent with the objectives of those guidelines for rigorous analysis.

Question 43. When does the Agency plan to deliver to the participants of the utility MACT FACA/work group the modeling and economic analysis that was promised to them for delivery on April 11, 2003?

Response. The Utility MACT Working Group was a Federal advisory committee organized for approximately 1 year as a working group under the Clean Air Act Advisory Committee (CAAAC). The Working Group finished its work when it delivered its final report to the CAAAC on October 30, 2002. The meetings and report were very informative and helpful to the rulemaking process. The agency is committed to do all the necessary analysis in order to propose a rule in accordance with our obligations under the Clean Air Act and Administrative Procedure Act. All of this analysis will be available to the public.

RESPONSES OF HON. CHRISTINE TODD WHITMAN TO ADDITIONAL QUESTIONS FROM SENATOR VOINOVICH

Question 1. Much has been said by critics that Clear Skies is not as environmentally protective as future Clean Air Act requirements would be—that it in fact would "roll back the Clean Air Act." It seems to me that one of the major advantages to Clear Skies is that it provides both regulatory and environmental certainty—that is, the fact that significant emission reductions are locked in according to statutory deadlines in 2008, 2010 and 2018 that cannot be circumvented or delayed the way that most requirements are now. How would you respond to those critics?

Response. Clear Skies would provide dramatic environmental benefits by reducing emissions from the power sector more than any control program any other Administration has ever proposed. It does so while allowing the downward trend in energy prices to continue and while promoting energy independence.

It is correct that one of the most important benefits of Clear Skies is that it would provide both regulatory and environmental certainty. Clear Skies builds on the successes of the Clean Air Act and would significantly improve air quality across the Nation by requiring power plants to reduce their emissions of SO_2, NOx and mercury by 70 percent. The mandatory emissions caps at the heart of Clear Skies are a sure thing and guarantee that reductions will be maintained over time. Because cap-and-trade programs include economic incentives for early action, Clear Skies would begin improving public health immediately. Through the end of this decade, the Clear Skies Act would clearly reduce power plant emissions more than would the current Act. Clear Skies also allows firms to make the reductions in the most cost-effective means possible. We do not have confidence in what would occur under the current Act after this decade, so we are unable to make a definitive statement about how reductions under the current Act would compare to reductions under Clear Skies in the out years. We do know, however, that the statutory caps in Clear Skies would provide certainty of reductions that could not be delayed by litigation. Without Clear Skies, we also know that, under the current Act, EPA and States will need to develop and issue regulations to reduce power plant emissions, but the levels and timing of these regulations are unknown. The uncertainties regarding regulatory development, litigation, implementation time, etc. under the current Act compare unfavorably with the certainty provided to this sector by Clear Skies.

Question 2. The threat of fuel switching—utilities switching from coal based generation to natural gas based generation—is a major concern that must be addressed. What effect will Clear Skies have on this problem—will it cause more utilities to fuel switch?

Response. The emissions reductions in the Clear Skies proposal would be achieved through the installation of emissions controls, rather than fuel switching. Under Clear Skies, 68 percent of U.S. coal-fired generation is projected to come from units with advanced SO_2 and/or NOx control equipment (such as scrubbers and SCR, which also substantially reduce mercury emissions) by 2010. In 2020, the percentage is projected to rise to 81 percent. In addition, the regulatory certainty provided by Clear Skies would likely result in fewer sources using repowering as a compliance strategy in the face of the complex requirements of the existing CAA.

We believe that fuel switching is more likely under the current Clean Air Act than under Clear Skies. Past EPA analyses have indicated that industry makes different decisions about how to make specified emission reductions when it knows all of the requirements up front (which would happen with Clear Skies) as compared to a situation where it learns about the requirements over time and has to start meeting some requirements without knowing specifics of future additional requirements (which would happen under the current Act). These past analyses have indicated that fuel switching is a more likely compliance option when industry learns the specifics of requirements over time rather than at once even when the control requirements are similar. Thus, we believe that, compared to Clear Skies, EPA's full implementation of the current CAA will likely result in considerably greater disruption to industry including additional fuel switching and a more substantive impact on gas consumption and prices—due to the less efficient, piecemeal approach to these regulations and litigation uncertainty (e.g., MACT, NSR, BART, and other efforts to achieve the NAAQS). EPA cannot predict how much fuel switching would occur under the current Act because that would depend on the specific requirements the industry will face, and those depend on numerous State and Federal rulemakings that have not yet been completed.

Question 3. How will the Clear Skies Act affect electricity prices and natural gas prices?

Response. EPA analysis projects that Clear Skies would not significantly impact electricity prices or gas prices. Forecasted trends would continue with or without Clear Skies. Clear Skies gives industry the certainty and flexibility it needs to make the most cost-effective investment decisions for reducing pollution. Costs are sometimes passed on to electricity ratepayers in the form of higher electricity prices, and modeling projects prices to be 2 percent higher in 2020 with Clear Skies compared to the base case. Also, Clear Skies ensures that coal-fired generation remains one of the cheapest methods for generating electricity, and does not have a major impact on natural gas supplies. Natural gas prices are projected to be less than 2.5 percent higher in 2020 with Clear Skies compared to the base case.

Question 4. Critics of Clear Skies have claimed that it would be possible to have greater emission reductions in a faster timetable during Phase I of Clear Skies. As evidence of this claim, these critics have pointed to a straw proposal that I understand was a staff proposal that leaked out of EPA during Administration consideration of the Clear Skies Initiative. How would you respond to those critics?

Response. The Administration discussed a number of policy options in the process of developing the Clear Skies proposal, including a straw proposal that EPA management presented as a way of initiating the inter-agency discussions necessary to develop an Administration position. EPA no longer believes that the straw proposal is feasible. In large part, this is because EPA's analysis of engineering, labor and capital markets for the power sector indicates that their ability to install the level of pollution controls required to meet the Phase I requirements of Clear Skies would significantly stretch the available labor resources. The Administration proposed different emissions caps and timing in Phase I of Clear Skies out of consideration for the engineering and construction markets ability to respond to the added demand for the installation and operation of emission control equipment.

Question 5. If our goal is to reduce harmful emissions from power plants—should we be focusing our attention on NSR or on Clear Skies?

Response. There is no doubt that we should be focusing on Clear Skies if our goal is to bring cleaner air to Americans as quickly and cost-effectively as possible. Clear Skies would bring vast improvements in air quality due to its substantial reductions in power plants emissions. Clear Skies sets forth a mandatory program that would dramatically reduce and permanently limit power plant emissions.

The dramatic emission reductions required by Clear Skies—70 percent reductions in SO_2, NOx and mercury—will drive new power plants and virtually all large existing power plants to install good controls. Our modeling projects that 80 percent of the coal-fired generation in 2020 would come from units with advanced SO_2 and/or NOx controls.

In contrast, New Source Review (NSR) does not require emission decreases—it prohibits emission increases and will be largely redundant when Clear Skies is fully implemented. The NSR program is not designed to result in nationwide reductions of air pollution from power plants. NSR is triggered only when facilities emitting large amounts of air pollution are built, or when modifications at large facilities result in significant increases in air pollution. In fact, NSR cannot be expected to decrease significantly nationwide emissions because facility operators will avoid the type of project that makes the facility subject to the program. In addition, given the nationwide cap on power plant SO_2 emissions, compliance with NSR should not reduce national SO_2 emissions.

RESPONSES OF HON. CHRISTINE TODD WHITMAN TO ADDITIONAL QUESTIONS FROM SENATOR THOMAS

Question 1. As you know the mercury characteristics of coal burned in western power plants is very different than coal in other regions. How does the Phase 1 mercury cap, which will supposedly be achieved through co-benefits, take into consideration these regional distinctions in coal chemistry?

Response. Different types of coal may achieve different mercury reductions from units with PM, SO_2 and NOx controls installed. Recent test data indicates that the installation of NOx and SO_2 controls on plants burning bituminous coals resulted in greater mercury reduction on average than plants burning subbituminous coals or lignite coals. Likewise, the test data indicated that installation of NOx and SO_2 controls on plants burning subbituminous coals resulted in somewhat greater mercury removal than plants burning lignite coals. On average, units burning lignite coal showed the least mercury removal of the three coal types. However, there is limited data on mercury removal from lignite coal.

In an effort to recognize the difference in mercury control among coal types, Clear Skies attempted to help equalize the cost of reducing mercury emissions across coal types—and the easiest way to do this was to adjust the allocation scheme. The adjustment factors of 1 for bituminous, 1.25 for sub-bituminous, and 3 for lignite coals reflect this variation in coal types. We believe the adjustment factors we used are directionally correct based on the test data currently available. EPA and others are currently collecting more information, and expect that this information will inform the debate on allocations further. We look forward to further discussion on this and other subjects.

Question 2. The Administration has incorporated the western SO_2 program adopted by the Western Regional Air Partnership (WRAP) into Clear Skies. Given that the WRAP program does not call for significant SO_2 reductions until the 2013–2018 timeframe, what co-benefits are being used to calculate the 2010 mercury cap in the west? Specifically, from where does the Agency specifically see those reductions being realized?

Response. Western sources would be required to meet NOx and SO_2 reductions under Phase I of Clear Skies. Clear Skies was designed to allow much of the first phase mercury reductions to be achieved through installation of NOx and SO_2 controls (selective catalytic reduction (SCR) and scrubbers, respectively) because such controls also remove mercury.

Under EPA's updated 2003 modeling results, much of the Phase I mercury reductions needed to meet the 26 ton cap would be achieved through the installation of such controls. A small portion of the Phase I reductions would likely need to be achieved through mercury-specific control technologies (e.g., activated carbon injection). With the mercury cap, we would expect the power industry to optimize their NOx and SO_2 controls for the greatest mercury removal. Because Clear Skies uses a cap-and-trade approach to reducing emissions, sources have an incentive to install controls that achieve reductions of both mercury and one or both of the other pollutants, to engineer these controls for greater mercury removal and to operate the plants that achieve the greatest mercury co-benefit removal a little more than they might without a mercury cap. Further, Clear Skies contains a safety valve price in order to protect against unexpected volatility in the mercury market.

Question 3. As it affects the Western U.S., help the Committee walk through the calculations of the Phase 1 mercury cap that is supposed to be achieved through co-benefits. The Phase 1 national cap of 26 tons represents a 46 percent reduction. If western mercury emissions of 4.3 tons were reduced by that amount it would result in a western cap of 2.0 tons. However, if all of the available sources in the west were scrubbed at an unrealistic level of 100 percent, the remaining western emissions would be 3.61 tons, much above the Phase I cap. Thus western sources would have no choice but to buy allowances in the market in order to comply. How, does this represent a realistic view of co-benefits?

Response. We are uncertain how some of the numbers contained in the question were derived. We would be happy to have EPA staff explore this issue with Senator Thomas' staff .

STATEMENT OF HON. GLENN MCCULLOUGH, JR., CHAIRMAN, TENNESSEE VALLEY AUTHORITY

Thank you, Mr. Chairman and members of the Subcommittee. On behalf of the TVA Board of Directors and our employees, I would like to thank you for the opportunity to appear today to discuss the Tennessee Valley Authority's views on clean air and more specifically S. 485, the Clear Skies Act of 2003. In our role as both steward of the environment and provider of electricity in the Tennessee Valley, TVA is uniquely positioned to comment on clean air issues facing our region and the Nation, and we appreciate the opportunity to share these views today.

TVA, and 158 power distributors, serves the 8.3 million people of the Tennessee Valley by producing affordable, reliable electricity while supporting sustainable economic development and maintaining stewardship of the region's natural resources. TVA's unique mission gives us the opportunity to see first hand the importance of finding the best balance between fueling a sustainable and vibrant economy and enhancing the quality of our natural environment. The TVA Board works every day to find that balance as it relates to many issues, and no aspect of that balance is of greater importance than the issue you are considering today—clean air.

TVA was created by Congress in 1933 to enhance the quality of life in the Tennessee Valley region. We do that by providing flood control and maintaining navigation on the Tennessee River, the nation's fifth largest river system, and by generating and transmitting electricity in the seven–State area that is the Tennessee Val-

ley. TVA meets the power needs of the region's homes, businesses, schools, and industries through 158 power distributors and by directly serving 62 large industries. TVA's electric power system includes 59 coal-fired units at 11 plant sites, three nuclear plants, 29 hydro-power plants, six combustion-turbine plants, three wind turbines, and 15 solar installations. The President's National Energy Policy recognizes the importance of diversity in energy supply including new emphasis on promoting nuclear energy, clean coal technologies, and renewable energy sources. TVA's mix of fossil, nuclear, hydroelectric and renewable generation not only helps ensure the reliability of the TVA system but also illustrates the value and benefits of such diversity for our Nation.

TVA is committed to its stewardship of the environment in the Tennessee Valley. I am proud to say that TVA has reduced sulfur dioxide (SO_2) emissions by 76 percent since 1977. In addition, we have reduced ozone-season emissions of nitrogen oxide (NOx) by 50 percent in the past 8 years. Through 2001 TVA has invested more than $3 billion to achieve these reductions even as the population, the economy and the energy needs of the Valley continue to grow at rates faster than the national average.

Since 1990, the population in the Tennessee Valley has grown by more than 15 percent, gross regional product by nearly 50 percent, and demand for electricity by more than 10 percent. In the past decade TVA has achieved historically high levels of operational performance and reliability in our power system and maintained affordable power rates—all while reducing emissions of sulfur dioxide and nitrogen oxide from our power plants. These actions demonstrate TVA's commitment to air quality and to finding the right balance between fueling the region's economy and continuing air quality improvements.

Today, TVA is in the midst of one of the most aggressive emissions reduction programs in the Nation. In November 2002, TVA approved plans to construct five more flue-gas desulfurization systems, or scrubbers, to reduce sulfur-dioxide at coal-fired power plants in Kentucky, Alabama, and Tennessee. These scrubbers will cost about $1.5 billion and collectively will reduce emissions of sulfur dioxide by an additional 200,000 tons per year. When construction is complete, we will have installed FGD scrubbers on more than half of our coal-fired generating capacity. This action, in combination with switching to low sulfur coal, will reduce TVA's total sulfur dioxide emissions by 85 percent since 1977 (see attachment GRAPH 1).

In addition to sulfur dioxide controls, we are investing more than $1.1 billion to reduce nitrogen oxide emissions by constructing controls such as selective-catalytic-reduction systems or SCRs on 25 coal-fired generating units. By 2005, TVA will have installed SCRs or similar technologies on more than 60 percent of its coal-fired generating capacity. These SCRs, in combination with low NOx burners and other controls, will reduce nitrogen oxide emissions by 75 percent during the ozone season (see attachment GRAPH 2). Between now and the end of this decade, we are committed to spending almost $1 million per day to accomplish these emission reductions. By 2010, TVA will have invested nearly $5.6 billion in cleaner air.

We believe this investment to reduce emissions from our coal-fired plants will pay significant dividends while providing a cost-effective return on that investment to continue air quality improvements in our region. We also know, however, that emissions from all sources—stationary and mobile—must continue to be reduced. For that reason I am pleased today to appear before this subcommittee to endorse the Clear Skies Act of 2003.

The current Clean Air Act has done much to reduce emissions and as a result the air quality we enjoy in this country has been improved significantly. However, the current Act is plagued with problems that could threaten the reliability and affordability of the nation's electric power supply. Low-cost, reliable electric power results, in part, from the power industry's ability to use a variety of energy sources, including coal. Today, the Tennessee Valley region depends on coal for approximately 60 percent of its power supply. Coal is also our nation's most abundant energy source for the future. Unfortunately, this critical energy resource faces a complicated web of overlapping, duplicative, and unnecessarily costly emission control requirements that do not provide the greatest return on investment and, furthermore, create enormous uncertainty for future investment. For example, there are now more than a dozen separate regulations for sulfur dioxide and nitrogen oxides alone and more regulations are just around the corner. At times, disputes over these regulations have significantly delayed the very air quality progress they were designed to achieve, thereby creating enormous uncertainty for future investment.

TVA believes this piecemeal approach to regulating power plant emissions should be replaced with a set of emission reduction targets and timetables for sulfur dioxide, nitrogen oxides, and mercury. We believe that Clear Skies, a well-designed multi-emission approach, will continue the national trend of better air quality and

provide additional benefits. These benefits include a streamlined regulatory process; sustained diversity in the nation's fuel supply; and more flexible, market-based mechanisms for achieving emissions reductions that are fair for both private and public power providers. This approach would also reduce compliance costs; and give the utility industry the certainty it needs to effectively plan and finance emission reductions without unduly burdening ratepayers. Such results have been well demonstrated by the very successful Acid Rain Program and they can and should be replicated elsewhere in the Act. Clear Skies appropriately allows continued use of SO_2 and NOx allowances that are guaranteed under existing programs. This is an important feature of the bill and should be preserved because companies will be encouraged to reduce emissions early and achieve greater levels of environmental benefit.

We do not believe, however, that Clear Skies or other market-based programs should replace all features of the Clean Air Act that regulate electric utility emissions. The National Ambient Air Quality Standards have been a vital part of the improvement in national air quality and they should be preserved as is done in Clear Skies.

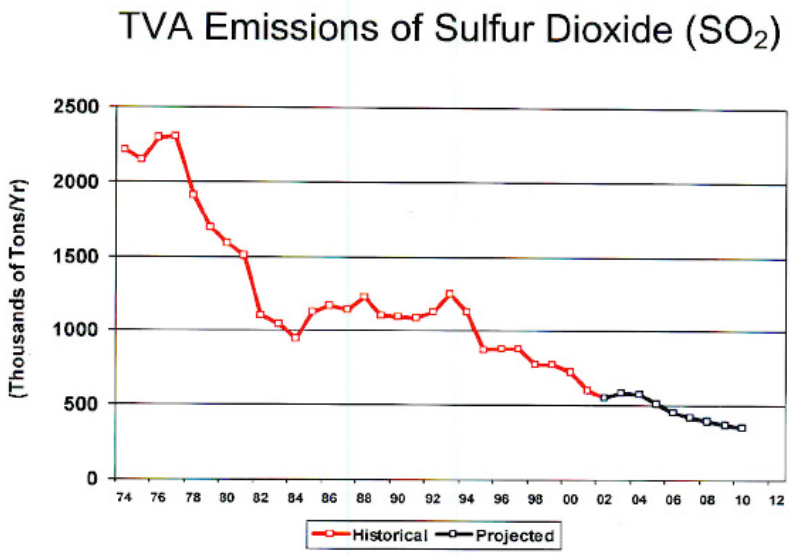
While TVA endorses the Clear Skies Act's reduction targets and timetables, we believe there are some provisions of the current bill that can be improved to achieve better overall results. Specifically, we urge you to ensure that the interim 2010 mercury target reflect the Administration's intent of reducing mercury to levels achievable via a cap and trade system through co-benefits with sulfur dioxide and nitrogen oxide control technologies. This would allow TVA and other utilities that have already reduced mercury through investments in sulfur dioxide and nitrogen oxide reductions to realize credit for their early actions. Otherwise, some may be required to install very expensive and as yet unproven mercury-specific controls, such as carbon injection and finishing baghouses.

Before I close, I want to emphasize that Clear Skies is a very aggressive proposal. As I mentioned earlier, TVA knows from first hand experience that extensive resources—time, equipment and skilled workers—will be necessary to make the reductions Clear Skies will require. Many of the critics of Clear Skies have never planned, designed, constructed, operated or financed these massive pollution control systems.

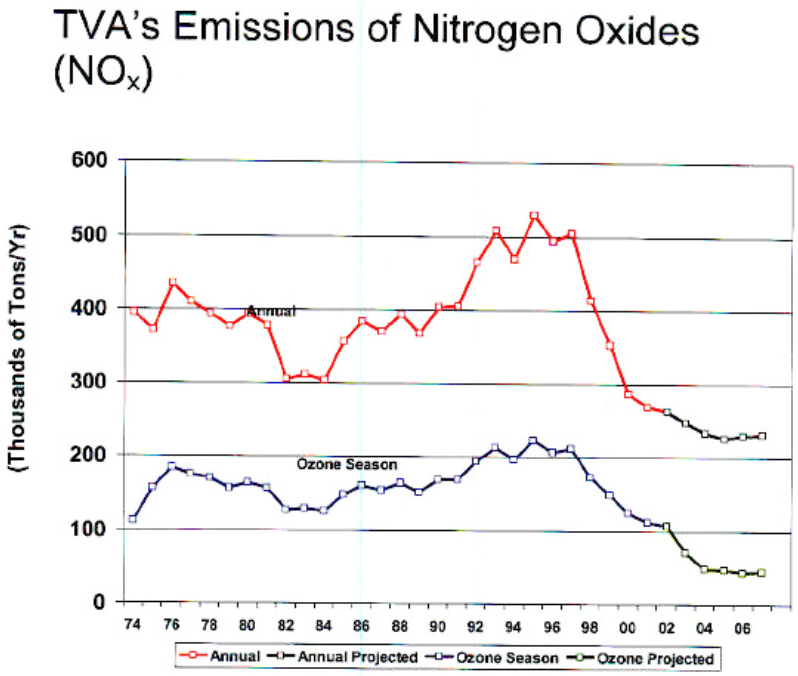
At TVA, we will soon have SCR or similar systems on 25 units and scrubbers on 18 units raising TVA's total investment in cleaner air to $5.6 billion. Achieving the results contemplated by Clear Skies would require us to construct 23 additional SCR systems and install scrubber technology on 40 more units at an additional cost of $4 billion between now and 2018. To do more, sooner than what Clear Skies requires would increase costs considerably while placing an unrealistic burden on the economy of the Tennessee Valley and our ratepayers.

I appreciate the opportunity to talk with you today about this important legislation. We at TVA are committed to improving the quality of life for the 8.3 million people of the Tennessee Valley. The TVA Board is setting a new standard of excellence for TVA's business performance and in our public service. On our watch at TVA, we are striving to find the best balance between providing the affordable, reliable supply of electricity that sustains a vibrant economy and continuing to improve the environmental quality of the Valley. Thank you again for allowing me to address these issues with you today and I am pleased to answer any questions you may have for me.

GRAPH 1


TVA Emissions of Sulfur Dioxide (SO_2)
(Thousands of Tons/Yr)
2500
2000
1500
1000
500
0
74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12
Historical
Projected

GRAPH 2



RESPONSES OF GLENN MCCULLOUGH TO ADDITIONAL QUESTIONS FROM SENATOR VOINOVICH

Question 1. Do you think that Clear Skies will have a positive effect or negative effect on the air quality in the Great Smoky Mountains National Park?

Response. The emission reductions required by the Clear Skies Act will have a positive effect on the air quality and resources of the Smokies. In my testimony, the emission reductions targets and timetables in Clear Skies were noted as being very aggressive. The reduction targets will result in deep cuts in emissions of nitrogen oxides (NOx) and sulfur dioxide (SO2) from utilities, and the timetable for these reductions is both short and certain. Unlike many requirements of the existing Clean Air Act that are prone to prolonged litigation, Clear Skies provides a logical and tested framework for achieving these reductions rapidly.

In my testimony, I also noted that TVA has already reduced its NOx emissions by over 50 percent since 1995 and has made a 76 percent reduction in SO2 since 1977. TVA's reductions undoubtedly have contributed to the improvements in air quality here in the Tennessee Valley. Yet air quality challenges remain, particularly in the Park. Clearly all air emission sources will have to reduce their emissions if we are to see overall improvements to the Park's air quality. With its national focus, Clear Skies should prove more effective in improving mountain air quality than any regional or single-source programs.

Question 2. As I mentioned in my opening remarks, fuel switching is a major concern of mine. I noticed in your testimony that you have a pretty diverse fuel mix for electric generation at TVA. What impacts do you think Clear Skies would have on your ability to maintain that diverse fuel mix?

Response. Clear Skies will enable us to maintain a diverse mix of generation assets and fuel sources. Make no mistake; Clear Skies will require a continuation of

major investments in pollution control technologies for our coal-fired plants. Yet, with these investments, TVA will be able to continue to provide affordable, reliable electrical power that is needed to support sustainable economic development while advancing TVA's stewardship of the region's natural resources.

Question 3. What impact would passage of the Clean Power Act (S. 366) have on TVA's ability to provide reliable affordable electricity to its consumers?

Response. Our review of the Clean Power Act indicates that the nation's infrastructure for generating and delivering energy in our region would be severely compromised. Sharp reductions of CO2 by 2007 would require a drastic shift from coal-fired generation to natural-gas-fired and nuclear generation. The enormity of this shift in fuel sources stretches the ability to realistically predict the consequences of such a change. Estimates from both DOE and EPA are shocking. Apart from a large increase in the cost of power, extensive reliance on natural gas as a primary fuel for electricity generation throughout the Nation would undoubtedly result in serious reliability and availability problems. It could also have devastating impacts on the use of natural gas for residential uses.

We have estimated that this legislation could require TVA to shut down over 3900 MW of our coal-fired generation, or more than 25 percent of the coal-fired generation on our system.

RESPONSES OF GLENN MCCULLOUGH TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. What impact would passage of the Clean Air Planning Act (S. 3135) have on TVA's ability to provide reliable affordable electricity to its consumers?

Reponse. Our review of the Clean Air Planning Act prompted, in part, a statement in my testimony that to do more sooner than what Clear Skies requires would increase costs considerably while placing an unrealistic burden on the economy of the Tennessee Valley and our ratepayers.

Question 2. What amount of reductions will Clear Skies require TVA to make in 2010 and in 2020 that aren't already planned or expected by TVA planners and management under the current Clean Air Act? In your response, please include any planning documents that discuss possible reductions required to be made in order to achieve attainment with the ozone or fine particulate matter NAAQS.

Reponse. As I testified, TVA currently is in the process of installing selective catalytic reduction (SCR) NOx controls on 25 of TVA's 59 units and 5 more scrubbers to control SO2 emissions from 12 of our units. We are installing these controls to meet requirements of the current Clean Air Act. Under Clear Skies, we project that we will have to install 23 additional SCRs on our system and scrubbers to control emissions from 40 more units. Some of these latter controls could be required when EPA issues additional regulations, but the number and schedule for additional control systems depends on the requirements of any future regulations and the resolution of the litigation that inevitably follows EPA rulemakings under the current Clean Air Act.

Question 3. In your testimony, you stated that if Clear Skies were implemented, TVA would have to install pollution controls on 23 additional units at a cost of another $5 billion by 2018. How much would TVA electricity consumers rates rise as a result of Clear Skies implementation?

Reponse. I stated that TVA will soon have SCR or similar systems on 25 units and scrubbers on 18 units raising TVA's total investment in clean air to $5.6 billion. Achieving the results contemplated by Clear Skies would require us to construct

23 additional SCR systems and install scrubber technology on 40 more units at an additional cost of $4 billion between now and 2018.

Spending an additional $4 billion between now and 2018 would impose a significant financial burden on TVA. TVA's goal has always been to pay necessary expenses out of existing revenues rather than increase rates and this would be our first response to costs incurred under Clear Skies. We have historically resisted rate increases unless absolutely necessary, as evidenced by the fact that the rate increase that is being discussed for fiscal year 2004 would only be our second in the last 16 years.

Question 4, What are TVA's projected annual pollution control capital and operating costs for the next 10 years? Please distinguish between the two categories in your answer.

Reponse. Through 2010, TVA forecasts capital expenditures for air pollution control equipment of over $2.3 billion dollars. This translates to an average annual

amount of approximately $300 million per year. Annual operating and maintenance costs associated with these controls are expected to average $34 million per year.

Question 5. What percentage of the TVA electricity consumers rate ($/kwh) does each of the categories in the previous question represent? Please reply for each of the last 3 years and the next 3 years.

Reponse. The rates that TVA charges its distributor customers and directly served customers are bundled rates that include all components of TVA's cost structure. The contributions of these individual components are not singled out. The spending levels discussed in the above response represent about 3.8 percent of TVA revenue over this period.

Question 6. Based on the Southern Appalachian Mountains Initiative analysis, utilities close to the Great Smoky Mountains National Park are having the greatest impact on air pollution problems. In order to return the Smokies to the natural visibility range of 77 miles in the summer, haze pollution would need to be reduced by 90 percent. But, as I understand it, Clear Skies would only provide a visibility improvement of 4 or 5 miles (that takes it from an average of 14 to 18 or 19 miles). Will TVA support or make deeper SOx reductions than Clear Skies would require in order to improve the visibility problems plaguing the park?

Reponse. The work done by the Southern Appalachian Mountains Initiative indicates that sources in States closest to the Smokies have a greater impact than sources in more distant States but this same research also shows that the closer sources account for less than 50 percent of the emissions that impact the Park. In other words, as a group, more distant sources are contributing substantially to air quality conditions in the Park. This is one reason why TVA supports national legislation like Clear Skies that will produce emission reductions from these more distant sources. I testified that Clear Skies is a very aggressive proposal. It will require deep cuts in emissions on top of what TVA and other utilities are already making. Because of limitations on necessary equipment and skilled labor, we think it would be very difficult to either accelerate the schedule or level of reductions called for by Clear Skies.

Question 7. How many TVA plants are located more than 50 kilometers from Great Smoky Mountains National Park?

Reponse. Our Bull Run Fossil Plant is approximately 46 kilometers from the nearest park boundary, and our Kingston Fossil Plant is approximately 49 kilometers from the park boundary. TVA is installing SCRs and scrubbers at these plants as part of our current system reductions. All of our other nine coal-fired plants are located greater than 50 kilometers from the park boundary.

Question 8. About 3 years ago, Joe Bynum of TVA testified before this Subcommittee. He said that TVA is a Federal agency and corporation. If that's the case, it seems inappropriate if not illegal for TVA to be suing EPA in court over New Source Review. Why hasn't TVA complied with EPA's administrative order on NSR, since all Federal agencies are required to comply with such orders under the Clean Air Act unless national security is invoked?

Reponse. There is nothing inappropriate or unlawful about TVA requesting the Eleventh Circuit Court of Appeals to review the EPA administrative order on NSR. EPA challenged the propriety of TVA's lawsuit and asked the Eleventh Circuit to throw TVA out of court. By unanimous decision, the Court found that TVA could sue EPA over the order and has allowed TVA's lawsuit to continue. Unlike other targeted electricity providers, TVA did not have an opportunity to contest EPA's allegations of NSR violations before an independent trial court. The Court of Appeals is the only entity to which TVA could turn to afford us and our ratepayers an opportunity to make our case before an independent entity and show that our efforts to maintain the reliability, availability, and safety of our power plants did not and does not violate NSR.

Question 9. If TVA fully complied with the EPA order on NSR as soon as possible, what would be the approximate reduction in TVA plant emissions annually and what would be the emissions performance at each of your fossil plants?

Reponse. If TVA had to comply with the EPA NSR administrative order as soon as possible, we do not know what the approximate emission reduction would be. This uncertainty is due in part to the order because it does not identify specific levels of control (these are to be determined by the States that regulate TVA's plants) nor does it identify specifically all of the units that TVA may have to control. I testified to the reductions that TVA is already making on its system and is committed to make. These reductions are very close to the level of reductions (on a proportional basis) that EPA has required of other utilities that have now settled EPA's NSR claims or litigation. However, EPA in these settlements has generally required that

the agreed-to reductions be made by 2012. TVA plans to complete similar reductions underway on its system by the end of the decade.

Question 10. Your testimony was that TVA will spend $5.6 billion by 2010 in cleaner air. In 2010, how many tons of pollution will TVA be emitting generally and at each plant?

Reponse. Estimates for future emissions (as opposed to emission reductions) depend on generation levels on our entire system and at each plant in the system. However, ignoring this uncertainty, we estimate that after we complete the installation of the additional SCRs on the TVA system, annual NOx emissions from our system will be about 230 thousand tons per year. When we complete the installation of the five additional scrubbers on our system, we estimate system SO2 emissions will be near 360 thousand tons per year. Attached are tables showing our estimates of emission rates by plants for both NOx and SO2.

Question 11. How many tons of allowances did TVA plants need to buy to "true-up" in each of the last 5 years, meaning that TVA facilities had emitted more pollution than their allocation under Title IV?

Reponse. Unlike some utilities, TVA decided to install emission controls and employ other strategies to comply with Title IV rather than buying SO2 emission allowances. Since the inception of the Title IV program of the Clean Air Act Amendments 1990, TVA has maintained a bank of SO2 allowances and has not purchased allowances to "true-up". Part of our strategy was to create a "bank" of allowances to help us better schedule the installation of necessary controls. TVA's bank was created by reducing emissions earlier than required, including the installation and operation of scrubbers on our two largest units. While TVA has periodically bought and sold allowances in the market, the net effect has been that TVA is effectively neutral in the emissions allowance market.

Question 12. TVA has recently announced plans to increase customer rates by about 8 percent. Are these increases to pay for restarting Brown's Ferry Unit 1 nuclear reactor or for NOx and SOx pollution controls?

Reponse. TVA's recently announced plan to increase its wholesale rates by an average of 5.9 percent is necessary to cover the increasing costs of NOx and SOx pollution controls while continuing to pay down the debt. By 2010, TVA will have invested nearly $5.6 billion in clean air. While these investments to date have been made out of existing revenues, the enormity of future clean air investments makes a rate increase necessary.

The rate increase that is being discussed is not an attempt to pay for the costs of restarting TVA's Browns Ferry Unit 1. By 2015, the investment in Brown's Ferry Unit 1 is projected to pay for itself from operating cash-flows. Additionally, TVA is exploring alternative financing arrangements to pay a portion of the restart costs.

Question 13. You stated that TVA is spending $527 million this fiscal year on clean air. Please describe the projects (>$5 million) that TVA defines as clean air and how they will contribute to cleaner air.

Reponse. These clean air related projects consist of SCR projects to reduce NOx emissions at seven TVA plants (Allen, Bull Run, Colbert, Cumberland, Kingston, Paradise, and Widows Creek) and SO2 reduction projects consisting of scrubber and fuel switches at three plants (Colbert, Johnsonville, and Paradise).

ATTACHMENT

Tennessee Valley Authority

Projected 2010 Annual SO2 Emission Rates

Plant	Unit	SO2		Expected 2010 SO2 Rate (lb/MMBtu)
		SO2 Control Technology	Status	
Allen	1–3			0.9
Bull Run		Scrubber	By 2010	0.3
Colbert	1–4			1.0
Colbert	5	Scrubber	By 2010	0.3
Cumberland	1	Scrubber	Existing	0.3
Cumberland	2	Scrubber	Existing	0.3
Gallatin	1–4			1.0
John Sevier	1–4			1.4
Johnsonville	1–10			1.4
Kingston	1–4	Scrubber	By 2010	0.3
Kingston	5–9	Scrubber	By 2010	0.3

Tennessee Valley Authority—Continued

Projected 2010 Annual SO2 Emission Rates

Plant	Unit	SO2		Expected 2010 SO2 Rate (lb/MMBtu)
		SO2 Control Technology	Status	
Paradise	1–2	Scrubber	Existing	0.5
Paradise	3	Scrubber	By 2010	0.3
Shawnee 1–9	1–9			1.0
Shawnee 10	10			0.6
Widows Creek	1–6			1.2
Widows Creek	7	Scrubber	Existing	0.5
Widows Creek	8	Scrubber	Existing	0.5

Tennessee Valley Authority

Projected 2007 Ozone Season NOx Emission Rates

Plant	Unit	NOx		Expected 2010 NOx Rate (lb/MMBtu)
		NOx Control Technology	Status	
Allen	1–3	SCR	Existing	0.1
Bull Run		SCR	By 2005	0.1
Colbert	1–4	SCR	By 2006	0.1
Colbert	5	SCR	By 2005	0.1
Cumberland	1	SCR	Existing	0.1
Cumberland	2	SCR	By 2005	0.1
Gallatin	1–4	LNB & OFA	Existing	0.3
John Sevier	1–4	LNB & OFA	Existing	0.4
Johnsonville	1–10	BLR OPT 1–6	Existing	0.6
		LNB U7–10	Existing	0.5
Kingston 1–8	1–8	SCR	By 2005	0.1
Kingston	9	OFA	Existing	0.45
Paradise	1–2	SCR	Existing	0.1
Paradise	3	SCR	Existing	0.1
Shawnee 1–9	1–9	LNB	Existing	0.4
Shawnee 10		AFBC	Existing	0.3
Widows Creek	1–6	LNB		0.5
Widows Creek	7	SCR	Existing	0.1
Widows Creek	8	SCR	By 2005	0.1

Expected Technology—Other control technology may be installed.
SCR—Selective Catalytic Reduction
OFA—Over-fired Air
ANCT—Advanced NOx Control Technology
LNB—Low NOx Burner
AFBC—Atmospheric Fluidized Bed Combustion

Statement of Jim Rogers, CEO and President, Cinergy Corporation, on behalf of the Edison Electric Institute

Introduction

Good morning. My name is Jim Rogers and I am Chairman, President and CEO of Cinergy Corp, which is a Midwest leader in electricity generation. Our regulated delivery operations in Ohio, Indiana, and Kentucky serve 1.5 million electric customers and about 500,000 gas customers. Cinergy's core energy system comprises approximately 13,300 megawatts at 14 base load stations and seven peaking stations. This portfolio includes 37 coal-based units that we operate and at least partially own. Altogether Cinergy is responsible for the operation of 114 electric generation units at 40 locations in 15 States. And, just so you fully understand why Cinergy is so interested in today's topic, more than 90 percent of the megawatt hours that we generate come from coal units. As I like to say, Cinergy is the largest non-nuclear utility in the United States

Today I am also testifying on behalf of the Edison Electric Institute (EEI). EEI is the association of U.S. shareholder-owned electric companies, international affiliates and industry associates worldwide. EEI's U.S. members serve more than 90 percent of all customers served by the shareholder-owned segment of the industry, generate approximately three-quarters of all of the electricity generated by electric

companies in the country, and serve about 70 percent of all ultimate customers in the Nation.

Since 2000, Cinergy has testified before this committee on several occasions, urging it to pass legislation that would alter the way power plant emissions are regulated. We have worked with the environmental community, with industry and with many of you on this committee. While we have not achieved unanimity within all of the stakeholder groups, there has been general consensus that the current Clean Air Act fails to deliver certainty for the environment, certainty for consumers or certainty for the industry.

In fact, in testimony in May 2000, major environmental groups recognized that the lack of certainty requires immediate attention:

"The Act is designed to address air pollution from the power sector on a pollutant-by-pollutant basis. The result is that there are numerous EPA regulatory initiatives all underway at present affecting different pieces of the power plant pollution problem, on different time scales, and with different geographic targets and often-different criteria. Each of these regulatory proceedings is subject to delay and court review the time has come to improve on the Act's current regulatory scheme for power plants. Surely the devil will be in the details but the stage has been set for a policy discussion that could drive us to a better, cleaner outcome."[1]

The multi-emissions idea has also garnered tremendous support from a diverse group of stakeholders including the United Mineworkers of America, International Brotherhood of Electrical Workers, the National Governors Association, the National Association of Counties, the Environmental Council of States, Candidate Al Gore, and, of course, President Bush.

The Edison Electric Institute's CEO Policy Committee on Environment, which I chair, has for several years actively addressed the multi-emissions issue. That committee recommended to the Board of Directors that EEI embrace the scope and framework of the President's Clear Skies Initiative. The Board has adopted that recommendation.

The Progress We Have Made

Before I venture into why multi-emissions legislation is so important, let me first quickly review how far the industry has come. The electric power industry has reduced its air emissions significantly, even as demand for electricity has increased. Attached is a chart that demonstrates that we have dramatically reduced our emissions of sulfur dioxide (SO_2) and nitrogen oxides (NOx.) We have also reduced particulate matter (PM_{10}) by over 90 percent. Moreover because some particulate matter, SO_2 and NOx controls have some mercury reduction co-benefits, our industry has also reduced mercury emissions significantly by almost 40 percent from 75 tons per year to approximately 48 tons per year.

We have done all this despite a steady climb in electricity demand and without sacrificing the reliability and affordability of the electricity that we produce.

Cinergy itself has invested considerable sums in clean air compliance. In the decade of the 90's, we spent more than $650 million, primarily to meet the SO_2 and NOx requirements of Title IV of the Clean Air Act. Between 2000 and 2005, we will spend an additional $800 million to build Selective Catalytic Reduction (SCR) pollution control units to meet the NOx SIP Call. To meet Clear Skies, we estimate our capital expenditures for just pollution control equipment will top these two sums combined or $1.5 billion. And unfortunately for Cinergy and most other utilities these costs are not back-loaded. We estimate that more than two-thirds of these expenditures are necessary to meet the first phase of the Clear Skies targets. Having said all that, the widely diverse commitment to support multi-emission legislation, even in the face of the costs I have just noted, clearly demonstrates that the electric utility industry is prepared to do more but we need to do it the right way.

Keeping Coal in the Fuel Mix

Low-cost, reliable electricity results, in part, from our ability to utilize a variety of readily available energy resources coal, nuclear energy, natural gas, hydropower, and new renewable energy resources such as wind and solar. Fuel diversity is key to affordable and reliable electricity. A diverse fuel mix helps to protect consumers from contingencies such as fuel shortages or disruptions, price fluctuations and changes in regulatory practices. A diverse fuel mix takes advantage of regional differences in fuel availability that have evolved over many decades. I have attached

[1]Testimony before the Subcommittee on Clean Air, Wetlands, Private Property and Nuclear Safety, Committee on Environment and Public Works, May 17, 2000. Testimony submitted on behalf of Clean Air Task Force, NRDC, USPIRG, National Environmental Trust and other environmental groups.

a chart showing that different parts of the United States are dependent on different sources of electricity.

While coal fuels slightly more than 50 percent of the generation produced in the United States, coal fuels more than eighty percent of the electrical generation in the Midwest. These coal plants help to keep the price of electricity down for consumers and businesses, an extremely important issue in Midwest States whose economies are already financially strapped.

Coal and the Clean Air Act

But coal-based electric generators face emissions control requirements in the Clean Air Act that are duplicative, contradictory, costly and complex—creating enormous uncertainty for future investment. Attached to my testimony is an EPA chart showing the complexity of the Clean Air Act for electric generators over the next decade (and it doesn't even include all the pre–2000 requirements that continue now and into the future). While I think many of these deadlines are ambitious and will be missed, the chart does show the regulatory muddle that coal-fired power faces.

The net result of the current regulatory system is a planning nightmare that makes it virtually impossible for electric generators to have any stable notion of what requirements will be in place for our plants at any point in the future. In addition to this chaos, are the long construction cycles and large capital expenditures that prohibit us from accurately assessing which plants should be retrofitted with controls, which plants should be switched to different coals or to natural gas, which plants should be retired and when any of this should take place. The result is a system that threatens the reliability and affordability of our nation's electric supply.

This regulatory morass also puts more pressure on the natural gas supply and delivery systems that already are yielding gas prices of great concern to the nation's industrial users and electric customers. Just this past winter, spikes in natural gas prices forced the Wheeling–Pittsburgh Steel Corp. to reduce or halt operations at three plants in Ohio. According to the American Chemistry Council, every dollar that the price of natural gas increases translates to about $1 billion in additional annual costs for the chemical industry that alone employs more than one million people directly.

Stephen Brown, director of energy economics at the Dallas Federal Reserve Bank stated that "strong energy prices weaken the economy and it's likely to retard the recovery. Nine of the 10 last recessions have been preceded by sharply higher energy prices."[2]

Ironically, the present system also does not advantage those seeking further emissions reductions from coal-fired power plants. The piecemeal approach inherent in the current Clean Air Act necessarily involves many sequential scientific and technical decisions by EPA and the States that may not necessarily be resolved in favor of the environmental community and, regardless are typically late in being made and then litigated by all sides, causing further delay. This regulatory soup may deliver cleaner air it hasn't so far but the chaos that accompanies this approach makes the timing of that environmental progress doubtful. And we will have the nation's energy policy set by Brownian motion. The end result of all of these rulemakings randomly bouncing against each other will form a totally unpredictable pattern. However there will be some certain consequences significantly higher electricity prices and further delays in environmental benefits.

For instance, implementation of National Ambient Air Quality Standards requires a series of sequential steps including monitoring of each air shed, designating nonattainment areas, inventorying emissions in the nonattainment area, modeling emissions in the nonattainment area, creating attainment demonstrations, and, finally, implementing these plans. Each step requires administrative action by the State or in some cases the State legislature followed by a formal approval by EPA. Because of this cumbersome process, there have been no nonattainment designations for either the fine particle NAAQS or the 8-hour ozone NAAQS, both of which were established in 1997. Once those designations of nonattainment areas occur, the Clean Air Act still allows States up to 12 years to bring nonattainment areas into compliance.

There is also no certainty around mercury reductions. While EPA is under a court order to finalize a mercury rule for coal-fired power by December 15, 2004, considerable uncertainty surrounds this endeavor. Under the Clean Air Act, maximum achievable control technology (MACT) standards are supposed to be based on the performance of the best available control technology in actual use in the source category. For coal-fired utility boilers, no high removal mercury-specific technology is in place. What reductions have occurred result from the installation of control tech-

[2]Wall Street Journal, February 28, 2003 "Effects of Gas Shortage Rip Through Economy

nology aimed at other emissions. But data quality and variability issues make simple extrapolation of these results (which is necessary in determining a standard) very problematic. Reductions fluctuate without explanation over time at a single unit; similar units with similar controls and coals experience very different results. As a result, EPA will need to build into the final rule emissions targets that reflect these fluctuations.

Add to this the reality that while the Clean Air Act generally requires a 3-year implementation period, there are extensions available, making implementation more likely in 2009 or 2010 and that does not count any delays spawned by the inevitable litigation, further delaying the implementation date.

By the way, the nominal 3-year period is too short for utilities to design, permit and install SO_2 scrubbers, the most cost effective means for bituminous coal to reduce mercury emissions. If utilities are held to the 3 years, we will be forced to focus our capital dollars on other extremely expensive and unproven technologies or switching to natural gas—both of which are ill-conceived outcomes for ratepayers, shareholders and the breathing public.

Why a Multi–Pollutant Approach Makes Sense

In contrast to the current piecemeal approach to regulation inherent in the existing Clean Air Act, a well-designed multi-emission approach is the best roadmap for further reducing power plant emissions. The right multi-emission bill will benefit electricity producers, consumers and the environment, by:

- Locking in major emission reductions today
- Locking in a timeline for those reductions so that emission control strategies can begin today resulting in cleaner air sooner
- Lowering the cost impact for consumers
- Coordinating reductions so that utilities are able to use multi-pollutant control technology
- Providing the electric industry in need of certainty with the time necessary to attract capital for the multi-billions of investments that will be needed to meet the new requirements
- Maintaining coal as a generation fuel thereby preserving natural gas reserves for consumers, farmers and businesses that rely on natural gas for their operations
- Saving jobs at existing coal-fired power plants and in the coal industry and creating new jobs to construct massive pollution control projects
- Providing flexibility through market-based programs such as emissions trading and early reduction credits
- Easing implementation for States to meet Federal clean air standards

The Clear Skies Act (S. 485)

The "Clear Skies Act" would require the most ambitious emissions reductions ever from power plants, ensuring air quality results that are cleaner, sooner, and cheaper. The emissions reductions would be rock solid, due to continuous emissions monitoring and large penalties for non-compliance. The scope and framework of the Clear Skies Act are ambitious and, for many companies including small public power systems, extremely painful. This is especially true for the first phase of Clear Skies.

Clear Skies would deliver additional dramatic reductions of power plant emissions cutting SO_2, NOx and mercury emissions by 70 percent from current levels while reducing costs and providing greater business certainty by combining multiple, overlapping regulations into a single set of reduction requirements.

An essential component of Clear Skies is that is provides industry with the time needed to attract capital necessary to make the reductions without jeopardizing the balance sheets. Given the current economic situation for our industry, we must spread the huge Clean Air capital investments over more than a few years in order to maintain our economic health.

And, the appropriate timelines also saves existing and creates new jobs. A deliberate approach to meeting emission reduction goals is essential for continued reliable electric generation and cost-effectiveness. Retrofits of additional selective catalytic reduction (SCR) systems for NOx, flue gas desulfurization systems (scrubbers) for SO_2, activated carbon and fabric filters for mercury will be needed on over 100 GW of power plants, which is the equivalent of 250 medium sized generation units. Each of these installations will require capital expenditures of anywhere from $60 million to more than $200 million.

Clear Skies represents probably one of the largest construction projects this nation will see. These installations must be spread over time to ensure reliability and stable prices that will not occur if too many large units are off line for retrofits at once. A smooth timeline also provides a steady construction program over the next 15 years. As we found with the NOx SIP Call, if controls are pushed within too nar-

row a time window, aside from increasing pressure on switching to natural gas, there will be labor and materials shortages and bottlenecks, which will greatly (and unnecessarily) increase costs.

Congress in the Clean Air Act Amendments of 1990 afforded the industry a decade to comply with reductions of fifty percent in SO_2 and NOx emissions. And just as Congress said in the 1990 amendments, a defined emissions target set over a reasonable timeframe resulted in real environmental improvements. Emissions reductions of seventy percent for three different emissions will be more costly, resource intensive and time consuming. Providing two phases of reductions, with the first phase limited to a fifty percent reduction, squares not only with reality but also with the precedent established in 1990.

As I have mentioned, the targets in the Clear Skies proposal are aggressive. To provide the planning certainty we need to meet these goals, the Clear Skies Initiative must also harmonize the existing Title I requirements including New Source Review; facilitate emissions trading; provide credit for early reductions; and distribute emission allowances equitably. The industry also has concerns about the auction provision that would only increase costs for those spending billions in retrofits with no commensurate environmental benefit. S. 366

While I prefer to emphasize the positive aspects of the Clear Skies Act, I cannot go without noting that S. 366, which Senator Jeffords and co-sponsors introduced on February 12, 2003, is unworkable and would cause tremendous economic hardship for my company, the industry and the Nation. All of the bill's new requirements would be placed on top of the existing Clean Air Act, exacerbating the complexity of an Act that already can give the Tax Code a run for being crowned the "most convoluted, Byzantine and difficult to understand" Federal law.

More importantly, S. 366 would greatly impact electricity prices, natural gas prices, coal consumption and other key factors. As you know, in November 2001, Mary J. Hutzler, the Acting Administrator of the Energy Information Administration, that as a result of S. 556, "the average delivered price of electricity in 2020 is projected to be 33 percent higher" and "natural gas prices are also higher by 20 percent."[3] An earlier EIA report pegged the loss of coal generation at 38 to 42 percent while natural gas generation increased by 60 percent.

And significantly, the analysis did not actually capture the full costs of S. 366 since many new, troublesome provisions were added in June 2002. EIA did not model S. 556's "Outdated Power Plants" provision, which will almost immediately cancel out the cap and trade program supposedly contained in the bill, and dictate compliance strategy. In fact, the Congressional Budget Office last November estimated the impact of S. 556 to power generators as possibly reaching $60 billion in just the year 2012.

Conclusion

While I know the challenges are daunting, I do believe that this Subcommittee can craft multi-emission legislation that both meets environmental goals and provides the industry with a workable roadmap. To do otherwise will ignore both an opportunity to make tremendous progress on Clean Air while ensuring the economic health of the energy industry. This industry, which faces enormous uncertainty on all fronts, is also the target of a morass of new Clean Air Act regulations which I have outlined today. These regulations threaten coal and dramatically increase compliance costs, yet leave environmental progress up in the air. With the economy in perilous shape at the national and State level, massive increases in the use of natural gas for generation will be very destructive. Environmental goals can and must be met, but fuel switching and consumer price increases must be kept to a minimum. That is why EEI and Cinergy support multi-pollutant legislation and the scope and framework of the Clear Skies Initiative. It delivers clean air with certainty while protecting workers, consumers and industry.

Finally, the time to act is now. I strongly believe that the window for passing multi-pollutant legislation will close next year due to national elections and further regulatory developments. So I respectfully ask this Subcommittee not to squander this unique opportunity to create a new chapter of Clean Air progress for the American people. It is time to find a sensible, practical solution to the environmental issues facing coal-fired power before we jeopardize our future.

We look forward to working with the committee, the Administration and other key Members of Congress to help make this legislation a reality.

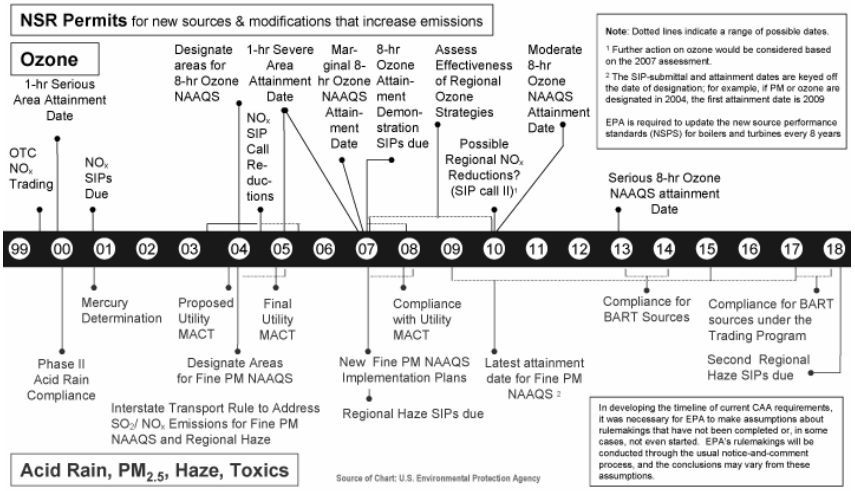
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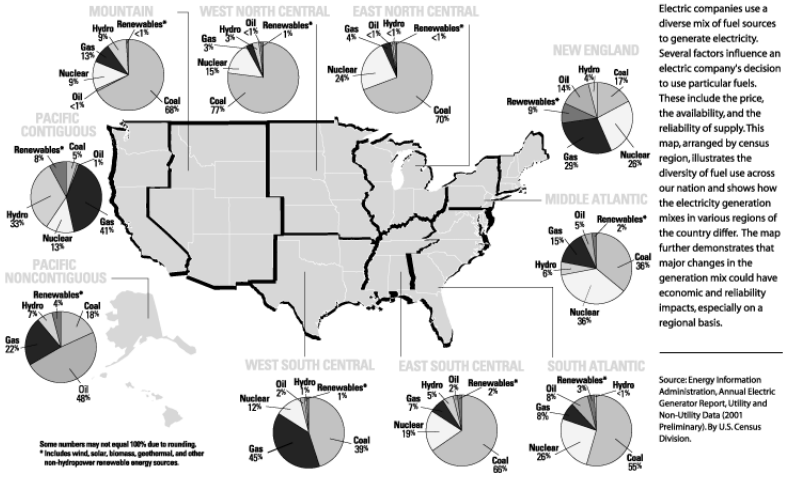
[3]Statement of Mary J. Hutzler, Acting Administrator, Energy Information Administration, Department of Energy, before the Committee on Environment and Public Works (Nov. 1, 2001) p.3

The Clean Air Act Is Complex And Contentious.

This picture explains EPA's current forecast of Clean Air Act requirements affecting electric companies.

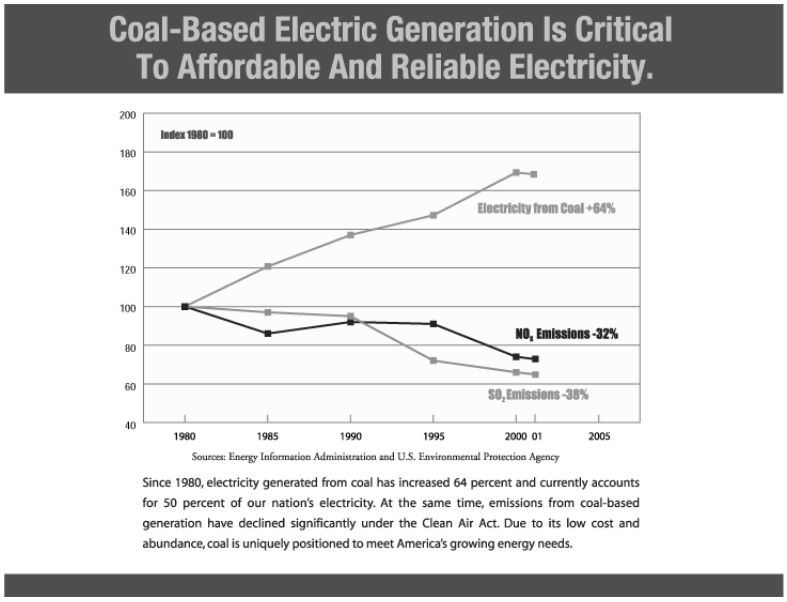


Different Regions of the Country Rely on Different Fuel Mixes to Generate Electricity.



Electric companies use a diverse mix of fuel sources to generate electricity. Several factors influence an electric company's decision to use particular fuels. These include the price, the availability, and the reliability of supply. This map, arranged by census region, illustrates the diversity of fuel use across our nation and shows how the electricity generation mixes in various regions of the country differ. The map further demonstrates that major changes in the generation mix could have economic and reliability impacts, especially on a regional basis.

Source: Energy Information Administration, Annual Electric Generator Report, Utility and Non-Utility Data (2001 Preliminary). By U.S. Census Division.



STATEMENT OF BRADLEY CAMPBELL, DIRECTOR, NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, ON BEHALF OF THE NORTHEAST STATES FOR COORDINATED AIR USE MANAGEMENT (NESCAUM)

Good afternoon. My name is Brad Campbell. I am Commissioner of the New Jersey Department of Environmental Protection. I speak today for the eight Northeast States that make up the Northeast States for Coordinated Air Use Management (NESCAUM). I understand that many of the views I will offer are also shared by the States of the larger Ozone Transport Commission. I appreciate the opportunity to testify before the committee today to present a Northeast States' perspective on the critically important issue of Federal action to reduce power plant pollution.

I want to begin by emphasizing that the Northeast States strongly support efforts to enact multi-pollutant legislation, and have so testified before this committee in the past. We applaud the Administration and this committee for making passage of such legislation a priority for the 108th Congress. It has been over a decade since the last Clean Air Act Amendments, and the time has clearly come for a new national policy to address the broad array of public health risks and environmental harms caused by power plant emissions.

In the Northeast, where sulfur dioxide and nitrogen oxides emissions from upwind power plants contribute significantly to problems ranging from fine particle and ozone pollution to acid rain, eutrophication of surface waters, and poor visibility in our parks and wilderness areas, we have long appreciated the need for concerted Federal action. With mercury contamination necessitating fish consumption advisories for most of our lakes and rivers, we see an urgent need for new measures to curb the continued buildup of this persistent, potent neurotoxin in our environment. And we see the problem of climate change as presenting unprecedented challenges for our ecosystems and quality of life, but also great economic opportunity for those who develop and provide the clean energy technologies of the future.

For all of these reasons, the Northeast States have followed with keen interest the development of several multi-pollutant initiatives now before Congress, including the Administration's "Clear Skies" proposal. In evaluating each initiative, we have asked three core questions:

- Is it comprehensive?

- Is it adequate to address the significant public health and environmental challenges we face?
- Does it strengthen our ability to ensure continued clean air progress, not only at the national level, but also at the local, State and regional levels?

Recognizing Clear Skies as a starting point for the committee's deliberations, I want to focus my remarks today on where and how we believe Clear Skies needs to be improved to meet these tests.

First, emissions reductions can and must happen sooner. As you know, many areas of the country need to attain new, more stringent health-based Federal standards for ozone and fine particles in the next 4–7 years. Yet the emissions caps in Clear Skies won't be fully implemented until 2018. Delaying necessary cuts for another 15 years is problematic for States trying to reach attainment, but it's even more problematic for the tens of thousands of people who experience serious health effects associated with unnecessarily high levels of fine particle and ozone pollution.

Second, we can and must do more to reduce mercury emissions. Given the persistent, bioaccumulative threat posed by this neurotoxin and the availability of highly effective control technologies, power plant mercury emissions should be capped at levels at least 50 percent lower than the 15 ton figure proposed in Clear Skies.

Third, national multi-pollutant legislation must address the intractable problem of interstate pollution transport in a concrete and effective manner, and must not weaken or remove crucial regulatory tools that States rely on to improve air quality at the local, State, and regional levels.

Clear Skies offers no guarantee that long-standing regional transport concerns will be solved under a new national emissions trading program, yet States would be prohibited from petitioning for Federal action to address transport until after 2012. Even then, the new hurdles Clear Skies establishes for Federal intervention would make the current transport provisions of the Clean Air Act practically unenforceable.

States support constructive reform of the Clean Air Act, provided it genuinely advances our clean air objectives and is strictly tied to the actual implementation of new reduction requirements. Clear Skies appears to go too far in the name of regulatory reform, however, proposing to substantially weaken or even eliminate several provisions of the current Clean Air Act. A list of several such concerns—including New Source Review, regulation of non-mercury toxins, potential local impacts, and protection of States' rights—is attached to my written testimony. The bottom line is that when it comes to protecting public health, it is far better to have too many tools and not need some than to have too few tools and come up short regarding our citizens' quality of life.

The final issue I want to address is carbon dioxide. We believe it belongs in multi-pollutant legislation because without it, the market signals and business certainty needed to promote sound long-term resource choices and investment decisions by the electric power industry will remain absent. The inevitable long-term result is greater climate risk—and higher costs—for both industry and consumers. The Northeast States feel so strongly about the need to act on climate change that many have made State-level commitments to reduce greenhouse gas emissions and/or have included carbon in their own, more aggressive 4-pollutant initiatives. The several such efforts already in effect show that the Northeast States are willing to lead by example, but as downwind States, we can't do it all by ourselves.

In short, we support multi-pollutant legislation that cost-effectively does both more and less than Clear Skies proposes. More—and sooner—in terms of pollution reductions; less in terms of changing the Clean Air Act.

This is precisely how the "Straw Proposal" that EPA originally drafted as the Administration's multi-pollutant initiative could be described. The Straw Proposal called for emissions reductions closer to 85 percent (compared to Clear Skies' 70 percent) and, importantly, for reductions to be fully implemented by 2010–12. Moreover, EPA's own analysis showed that the health benefits of this substantially more aggressive approach far outweighed its costs. EPA's analysis showed that implementing the Straw Proposal would cost $3.5 billion more than Clear Skies in 2020, but it would produce $59 billion in additional health benefits. We urge the committee to re-visit EPA's Straw Proposal and other current legislative alternatives that go further toward capturing these benefits.

In closing, let me thank you for considering our views and again commend the Administration for pushing forward on multi-pollutant legislation. The issues are complex, and the debate will no doubt be intense. But the Northeast States look forward to playing a constructive role, and we hope all sides can agree that the opportunity and need for real progress on these issues is as great as the public health, environmental and energy challenges we face are daunting.

Technical Concerns of the Northeast States Regarding S. 485, the Clear Skies Act of 2003

Clear Skies diminishes or repeals entirely some of States' most important tools for achieving Federal, health-based air quality standards:

- New Source Review (NSR)
- The utility Maximum Achievable Control Technology (MACT) rule as it applies to hazardous air pollutants (HAPs) other than mercury
- Residual risk requirements for mercury
- Lowest Achievable Emission Rate (LAER) and offset requirements and conformity for most areas of the country
- Use of Section 126 until 2012, and only then under a higher burden of proof
- Some Prevention of Significant Deterioration (PSD) requirements
- Protection of visibility in Class I airsheds.
- Clear Skies appears to undermine, if not preempt entirely, State and local authority to adopt and to take State Implementation Plan (SIP) credit for more stringent requirements for power plants.
- Clear Skies provides no protections against adverse local health and environmental impacts that could arise, and does not require even a minimum level of control at each power plant.
- Regulatory relief under Clear Skies is provided expeditiously, but corresponding emission reduction requirements are delayed for years—a serious unbalancing of these dual policy objectives.
- Clear Skies' approach to allocating allowances appears to continue the practice of rewarding past high emitters, rather than encouraging economic efficiency through output-based allocation approaches and/or approaches that reward combined heat and power (CHP) applications.

STATEMENT OF DAVID HAWKINS, CLIMATE CENTER PROGRAM DIRECTOR, NATURAL RESOURCES DEFENSE COUNCIL

Summary

Mr. Chairman and members of the Subcommittee, thank you for inviting me to testify on behalf of NRDC, the Natural Resources Defense Council, and its more than 500,000 members regarding S. 385, the Administration's bill to amend the Clean Air Act. We have examined the Administration proposal and we conclude it would harm public health, weaken current pollution fighting programs and worsen global warming.

In my testimony today, I will emphasize three major policy failures in the Administration's bill. S. 385 would do the following to our nation's clean air program:

- Allow power plant pollution to continue to inflict huge, avoidable health damages on the public.
- Repeal or interfere with major health and air quality safeguards in current law.
- Worsen global warming by ignoring CO_2 emissions from the power sector.

NRDC supports good legislation to amend the Clean Air Act. We worked with the first Bush Administration in 1989 and supported the cap and trade program that was enacted in the 1990 amendments to the law. But the current Administration proposal is not good legislation: it would take two enormous steps backward and fail to take a critical step forward on global warming.

Fortunately, your choices are not limited to accepting the Administration's plan or taking no action. As Senators you have the right to ask the Administration to explain the policy choices in the bill it has sent to you. If you conduct a thorough inquiry into the Administration plan and alternatives we believe you will conclude that the Administration's bill should not become law. Congress can do much better and the public deserves much better. We want to work with you to deliver that better solution to the public.

I. THE ADMINISTRATION PLAN IMPOSES UNACCEPTABLE AND AVOIDABLE HEALTH COSTS ON THE PUBLIC

Air pollution from power plants imposes a staggering toll of death, disease, and environmental contamination on the American people.

Sulfur dioxide (SO_2) and nitrogen oxides (NOx) emissions from power plants create dangerous concentrations of fine particles and ozone (soot and smog) in the air that 175 million people breathe. Soot and smog caused by power plant emissions is causing 30,000 premature deaths, hundreds of thousands of asthma attacks, and millions of days of illness and lost work each year.

Mercury emissions from power plants fall from the air and wash into lakes, rivers, and coastal waters, where they concentrate in fish. Mercury is a potent brain poison (neurotoxin) even in very small amounts. Forty-four States have issued warnings against eating local fish because of mercury contamination.

Power plant pollution is causing a major, ongoing public health crisis. The Bush Administration's proposed air pollution plan fails to stem this crisis.

By any comparison, the Administration's plan allows power plant owners to continue an unacceptable and unjustifiable toll of preventable death and illness. Measured against alternative legislative proposals including an alternative proposal developed within the Administration itself in 2001 the Administration plan would result in more than 100,000 additional early deaths and millions of additional asthma attacks and other illnesses between now and 2020. The Administration's plan also would result in hundreds of tons more mercury released into the atmosphere over this period. The same conclusions emerge when the Administration's plan is measured against faithful enforcement of the current Clean Air Act.

The Administration rejected an alternative proposal, developed by EPA in August 2001, that would have dramatically reduced this toll of death, illness, and environmental contamination. When expressed in monetary terms, the benefits of the EPA proposal dwarf its cost. But the Administration has submitted to you the much weaker plan found in S. 385. By sending you its weaker plan, the Administration is asking you to vote for a program that saves power plant owners $3.5 billion per year in pollution control costs but imposes at least $61 billion per year in additional avoidable health costs on the American people.

In our view, the Administration owes you and the American people some straight answers to these questions:

Why should the public accept the enormous toll of preventable death and illness from power plant pollution that will still occur under the Administration's plan?

Why should Americans suffer tens of billions of dollars each year in health costs that could be avoided at a fraction of that cost?

Why don't the American people have a right to expect whether from the current Clean Air Act or any new legislation much deeper and quicker reductions in power plant pollution than the Administration's plan would provide?

The Administration Plan vs. the EPA Proposal

The original "Clear Skies" proposal was developed in 2001 by the Environmental Protection Agency.[1] The EPA proposal was developed with the goal of delivering at least as much clean-up of sulfur, nitrogen, and mercury emissions as required under the current Clean Air Act with the purported advantages of a cap and trade program. Unfortunately, while the Administration's plan before you today keeps the title, the program has been converted from one that speeds clean air to one that shields power plant owners from faster cuts in their pollution.

After intense lobbying by power plant owners, the White House rejected the targets and timetables in the EPA proposal and proposed a plan allowing much greater continuing pollution from this industry. The larger pollution loads allowed by the Administration's CSI plan are summarized in the following chart:

Bush Administration Plan (CSI) v. EPA Proposal (Aug. 2001)

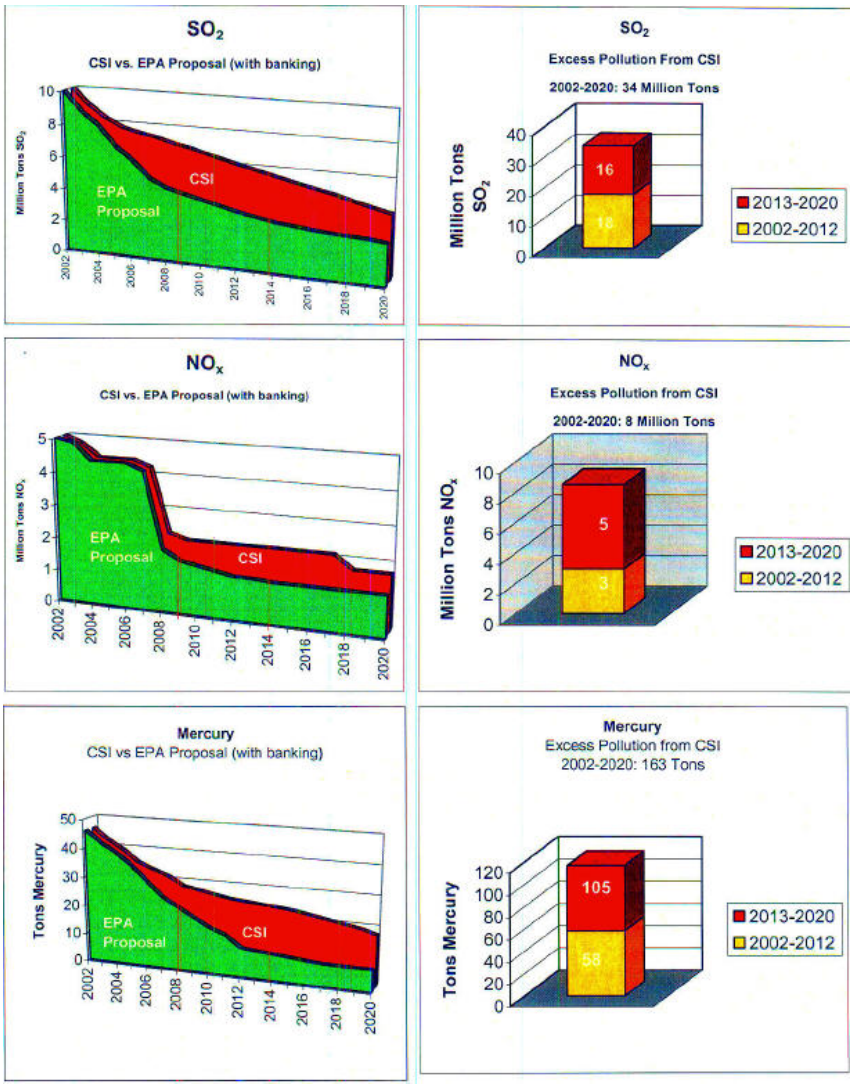
	Sulfur Dioxide (SO_2)	Nitrous Oxide (NOx)	Mercury (Hg)
EPA Proposal	2 million tons in 2010	1.9 million tons in 2008	24 tons in 2008
		1.25 million tons in 2012	7.5 tons in 2012, with 70 percent facility-specific reduction
Administration Plan	4.5 illion tons in 2010	2.1 million tons in 2008	26 tons in 2010
	3 million tons in 2018	1.7 million tons in 2018	15 tons 2018

The differences in the amount of pollution allowed by these two plans, both year by year and cumulatively out to 2020, are huge.[2] The Administration's plan would

[1]U.S. EPA, "Comprehensive Approach to Clean Power: Straw Proposal and Supporting Analysis for Interagency Discussion," August 3, 2001. ("EPA August 2001 Analysis") Available at http://www.catf.us/publications/other/EPA—Straw—Proposal.pdf.

[2]The results shown in the figures below are based on EPA analyses with the Integrated Planning Model (IPM), the standard modeling tool used by all stakeholders in the power plant debate. They show the pattern of emissions expected under the two plans, including the impact of "banking," which results in some reductions below the caps in early years in order to emissions at levels above the caps in later years.

result in 42 million tons more pollution than the EPA proposal: For SO_2, 18 million tons more through 2012 and 34 million excess tons out through 2020. For NOx, 3 million tons more through 2012 and 8 million excess tons out through 2020. The Administration's plan would also allow 58 tons more mercury through 2012 and 163 tons more out through 2020.



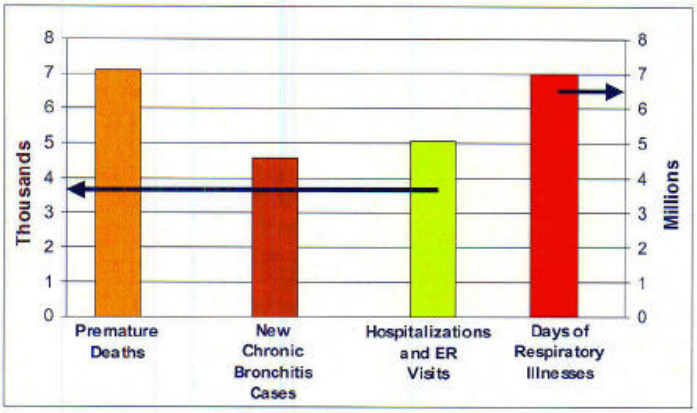
Health Consequences of Administration Plan's Excess SO_2 and NOx. The Administration's plan means large numbers of Americans will continue to die prematurely or suffer illness caused by the excessive pollution power plants would continue releasing under the plan. Figure 7 shows EPA's estimates of the additional premature death toll and illness in 2020 under the Administration's plan:[3]

[3]EPA calculated the incidence of premature death and illness for both its August 2001 proposal and the Administration CSI plan using the same peer-reviewed methods and summarized the results in its technical analysis documents. The health comparisons in this testimony are taken from the incidence figures presented in those documents. See, EPA August 2001 Analysis,

Continued

- 7100 additional premature deaths
- 4600 additional chronic bronchitis cases
- 5100 additional hospital stays and ER visits
- 7 million additional days of respiratory illness

Greater Health Damages Under CSI
(additional cases in 2020 compared to EPA proposal)



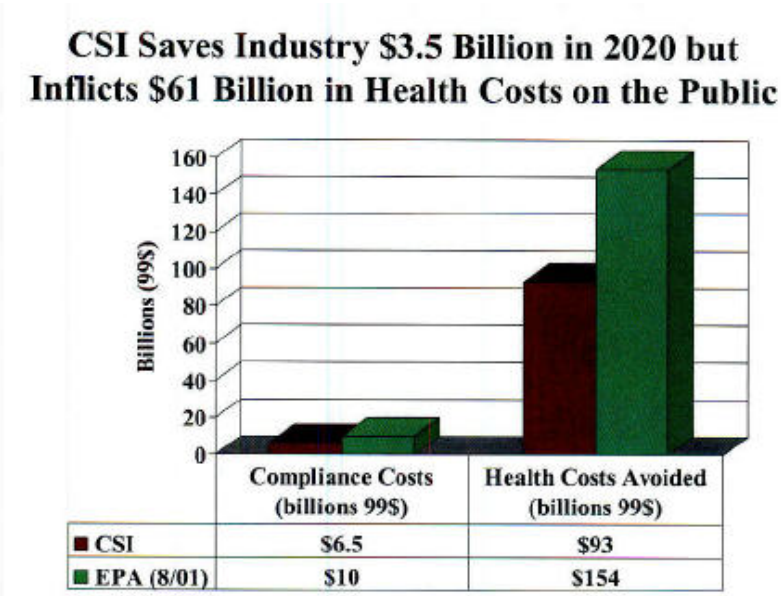
While EPA has not presented the cumulative additional premature deaths and illnesses allowed under the Administration's plan, those numbers are even larger. Using EPA methods, the Clean Air Task Force calculates that between 2008 and 2020, the Administration's plan would allow more than 100,000 additional premature deaths and would allow millions more asthma attacks and other illnesses.[4]

While we have fundamental concerns about attempting to reduce human death, illness, and misery into dollars, it is important to note EPA's estimate of the costs the Administration's proposal would impose on the public in monetary terms. EPA analyses show that the Administration proposal would result in $61 billion more in premature death and disease costs per year by 2020 than the EPA August 2001 proposal. While the EPA August 2001 proposal would cost industry $3.5 billion dollars more per year to implement, it would achieve over $15 in health benefits for every clean-up dollar spent. For some as yet unexplained reason, the Administration chose a plan that would inflict an additional $61 billion a year in health damages on the public in order to save power plant owners $3.5 billion in compliance costs. See Figure 8.

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supra, note 1, Appendix A at 3, and EPA CSI Technical Support Package, September 2002 at 29, at www.epa.gov/clearskies.

[4]Clean Air Task Force, "Health Damages Estimates for Clear Skies Initiative and Straw Proposal," April 2003.



The additional pollution from power plants under the Administration's plan will leave dozens of cities and counties out of attainment of the national ambient air quality standards for fine particles (soot) and ozone (smog) the Clean Air Act's bedrock measure of public health protection.

The Administration's analysis shows that its plan would leave 107 counties home to 77 million Americans in violation of these public health standards in 2010. 64 counties with 60 million residents would remain in violation even in 2020 after the plan's delayed second-phase requirements in 2018.

The stronger power plant emission curbs in EPA's 2001 proposal would bring 85 percent of eastern counties with unhealthy soot levels into compliance with the fine particle standard, and 90 percent of eastern counties with unhealthy smog levels into compliance with the ozone standard. Greater power plant pollution reductions would reduce population exposure in the remaining counties and make it substantially easier for them to reach the health standards with reasonable controls on other sources.

Health Consequences of Administration Plan's Excess Mercury. Coal-burning power plants are the largest industrial source of mercury air pollution, and the only one still not subject to clean air safeguards. Mercury emissions from power plants fall from the air and wash into lakes, rivers, and coastal waters, where they concentrate in fish. Mercury is a potent neurotoxin even in very small amounts. Forty-four States have issued warnings against eating local fish because of mercury contamination.

Methylmercury (the form of mercury that is absorbed in tissue) is highly toxic, interfering with the development and function of the central nervous system. Infants can ingest methylmercury from breast milk when mothers have eaten contaminated fish. Children who eat such fish are exposed that way as well. Children and infants are at higher risk of mercury poisoning because their nervous systems continue to develop until about age 14. Health effects linked to prenatal methylmercury exposure include:[5]

- poor performance on tests of attention and language
- impaired memory
- inability to process and recall information
- impaired visual and motor function

[5]U.S. EPA, 1997f. Mercury Study Report to Congress, Volume V: Health Effects of Mercury and Mercury Compounds. EPA–452/R–97–007; Toxicological Effects of Methylmercury, National Academy Press, Washington, DC, 2000.

One in 12 women of childbearing age has mercury levels above EPA's safe health threshold, according to a Centers for Disease Control and Prevention report published in January 2003 and a Journal of the American Medical Association published last week.[6] Nationally, this translates into nearly 4.9 million women of childbearing age with elevated levels of mercury from eating contaminated fish and more than 300,000 newborns at risk of neurological impairment from exposure in utero.[7]

An estimated 60,000 children are born each year at a significantly increased risk of adverse neurological effects from mercury and current exposure levels increase the number of children "who have to struggle to keep up in school and who might require remedial classes of special education," according to the National Academy of Sciences.[8] Eating mercury-tainted fish also can harm cardiovascular and immune systems in adults.[9]

Every ton of mercury emissions from power plants adds to the cumulative and persistent mercury loadings in our lakes and streams. EPA's IPM runs show that under the Administration's plan, power plants would add loadings of 163 tons more mercury through 2020 than under the EPA proposal.[10] Because mercury is an accumulative toxin, these added tons will do their damage for scores of years after they are released.

The cumulative and persistent nature of mercury contamination underscores the need to minimize emissions from all sources. The weak and delayed mercury provisions in the Administration's plan will result in a failure to apply technology capable of removing power plants as a significant source of mercury. This means more continued mercury pollution not only from U.S. sources but from power plants worldwide. As we have demonstrated with another brain poison, lead, when the U.S. shows leadership in advancing policies to cut dangerous pollution, the rest of the world follows. The United Nations has identified global mercury pollution as a priority but the signal by the Administration's plan is that the U.S. will go slow. This will almost certainly translate into a global go-slow approach, meaning higher mercury emissions from the rest of the world continuing to be deposited in the U.S..

The Administration Plan vs. the Clean Air Act

It is also appropriate to assess whether the Administration's plan would deliver more pollution reduction than the current Clean Air Act, or less. In fact, the Administration's plan would result in millions of tons more pollution than faithful enforcement of the current law.

SO_2 and NOx: The Administration claims that its plan would reduce SO_2 and NOx emissions by 35 million tons more than the current Clean Air Act through 2012. In fact, just the opposite is true: compared to enforcing the current law, the Administration's plan actually would allow major increases in SO_2 and NOx in the next ten to 15 years.

What accounts for these different assessments of the Administration's plan? The secret is in the Administration's yardstick. The Administration is comparing its proposal with a misleading "baseline" that expressly assumes EPA does not enforce the Clean Air Act. EPA Assistant Administrator Holmstead has candidly called this the "Rip Van Winkle scenario."[11] The Rip Van Winkle scenario includes only the power plant pollution limits that are on the EPA books at this moment principally the SO_2 reductions already required by the Title IV 1990 acid rain program and NOx cuts ordered under the "NOx SIP call" in 1997. The Rip Van Winkle scenario assumes that EPA goes to sleep, doing nothing more for more for a decade.

But the existing Clean Air Act requires much more than that. It requires the States and EPA to bring our cities and counties into compliance with the national ambient air quality standards for fine particles and ozone (soot and smog pollution)

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[6]Centers for Disease Control, January 2003. Second National Report on Human Exposure to Environmental Chemicals; Susan E. Schober, et. Al, "Blood Mercury Levels in U.S. Children and Women of Childbearing Age, 1999–2000," Journal of the American Medical Association, 289: 1667–74 (2003)

[7]Derived by the Clean Air Task Force from 2000 census data and fertility data from the National Center for Health Statistics.

[8]Toxicological Effects of Methylmercury, National Academy Press, Washington, DC, 2000.

[9]High levels of mercury in seafood linked to infertility. BJOG: an International Journal of Obstetrics and Gynecology. 109:1121–5, 2002; Toxicological Effects of Methylmercury, National Academy Press, Washington, DC, 2000.

[10]While most mercury comes from coal-fired power plants, the IPM runs reveal that several tons of mercury come from oil-fired plants that would not be covered under the Administration's plan (or under the EPA 2001 proposal). These tons of mercury are also of concern and should be covered by mercury controls under either new legislation or existing law.

[11]Mr. Holmstead so characterized the Administration's baseline assumptions in a presentation to the National Association of Regulatory Utility Commissioners in Washington on February 24, 2003.

before the end of this decade, unless accomplishing that task can be shown to be not possible. EPA concedes that meeting health standards will require steeper and faster reductions in power plant SO_2 and NOx emissions than assumed in the Rip Van Winkle scenario or required by the Administration's plan.

Undr the current Clean Air Act the pathway for meeting public health standards begins with the designation of which cities and counties across the country do not attain the standards, based on several years of pollution measurements. These "non-attainment designations" will take place in early 2004 for ozone and by the end of 2004 for fine particles.[12]

The Clean Air Act then requires the States and EPA to implement the emission reduction measures needed to meet these public health standards within 5 years of these designations, by 2009, or sooner if feasible the law says "as expeditiously as practicable."[13] Deadline extensions are allowed only if a State rigorously demonstrates that pollution control measures to meet health standards on time are not available or feasible.[14] No such demonstrations have been made. While the States have primary responsibility to address local pollution sources, the Clean Air Act gives EPA special responsibility for interstate pollution that interferes with attainment of the health standards in areas downwind. EPA is required to order pollution reductions from upwind power plants where needed to bring areas in downwind States into timely compliance with the health standards.[15]

Administration spokesmen refuse to say how much reduction in power plants' SO_2 and NOx pollution is needed under current law to meet the public health standards on time. But EPA's analyses of the Administration's plan show that it will not result in sufficient clean-up to attain the standards on the schedule required by current law.

As I have already noted, the weak emission reductions in the Administration's plan leave 107 counties in nonattainment in 2010 and 64 counties in 2020. As mentioned above, current law requires attainment by 2009 or sooner unless this schedule is not practicable. But the Administration has presented no analysis arguing that its 2018 schedule for completing SO_2 and NOx reductions is the fastest practicable schedule. Indeed, analyses on EPA's web site show that while there may be some labor constraints between now and 2005, those constraints disappear well before 2010.[16]

In short, current law requires more reductions sooner than the Administration's plan and EPA's analyses show deeper and faster reductions are feasible.

The Administration may claim to be making a 35 million ton advance over the Rip Van Winkle scenario, but that is a phony measure. In fact an objective reading of the current law and EPA's analyses show that the Administration's plan would result in far more power plant SO_2 and NOx air pollution compared with enforcing the existing Clean Air Act

Mercury: The Clean Air Act also requires faster and deeper reductions of mercury than the Administration's plan. The current Act requires each mercury-emitting power plant to cut its emissions by installing the maximum available control tech-

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[12]The deadline for ozone designations is set forth in a consent decree entered in American Lung Ass'n, et al. v. Whitman, D.D.C. Civil Action No. 02–2239 (March 13, 2003). EPA has committed to an end-of–2004 deadline for fine particle designations as "one of the Agency's highest priorities, due to the serious health implications of $PM_{2.5}$ fine particle exposure. . . ." Memorandum from Jeffrey R. Holmstead, Assistant Administrator, to Regional Administrators (Nov. 14, 2002), at 3.

[13]Clean Air Act §7502(a)(2)(A). See Sierra Club v. EPA, 294 F.3d 155, 162–63 (D.C. Cir. 2002) (State must adopt all reasonably available measures capable of advancing the date on which the polluted area will attain the NAAQS). "In order for the EPA to determine whether an area has provided for implementation as expeditiously as practicable, the State must explain why the selected implementation schedule is the earliest schedule based on the specific circumstances of that area. Such claims cannot be general claims that more time is needed but rather should be specifically grounded in evidence of economic or technologic infeasibility." Memorandum from John S. Seitz, director of EPA's Office of Air Quality Planning and Standards, to EPA regional air division directors (November 2, 1999), at 1

[14]Clean Air Act §7502(a)(2)(A). EPA also may grant a maximum of two 1-year deadline extensions if an area has met all its requirements and experiences "no more than a minimal number" of violations of the health standards in the otherwise applicable deadline year.

[15]Clean Air Act §7410(a)(2)(D)(I), §7426.

[16]U.S. EPA, Engineering and Economic Factors Affecting the Installation of Control Technologies for Multipollutant Strategies, October 2002.

nology ("MACT").[17] EPA must issue mercury standards in 2004.[18] Compliance with the MACT standard is required 3 years later, at the end of 2007.[19] Given the extreme toxicity of mercury, the current law does not permit emissions trading between mercury-emitting sources.

Because EPA has not yet issued the MACT standard, the Administration argues that no one can say how much mercury it will allow. Mercury MACT controls on other sources, however, provide a good indication of what is feasible. The MACT pollution controls on municipal and medical waste incinerators, for example, eliminate at least 90 percent of these sources' mercury emissions.

In December 2001, EPA told the Edison Electric Institute, the power sector's main trade association, that an equivalent MACT standard for power plants would reduce mercury emissions from 48 tons to 5 tons nationwide by the end of 2007.[20] In the regulatory development process now underway, EPA is evaluating performance requirements that would achieve a reduction to 5 tons per year. The weakest option being analyzed by the agency (at the request of the utility industry) is a level only slightly higher than the Administration's plan second-phase target of 15 tons.

No one, including the Administration, has contended that a standard as weak as the Administration's plan first-phase target 26 tons could pass muster under the MACT requirement of current law. Even a MACT standard that reduced emissions by only 70 percent would cut mercury pollution to 15 tons 10 years earlier than the Administration legislation.

The Administration's plan, however, would repeal the MACT requirement and delay any initial mercury reductions to 2010. After that, the Administration's plan would allow 26 tons per year from 2010 through 2017, and 15 tons every year thereafter. Compared to the 5-ton level, the Administration's plan would allow more than five times as much mercury pollution through 2017, and three times as much each year after. From 2008 through 2020, that would be 284 tons more cumulative loading of mercury under the Administration's plan.

II. THE ADMINISTRATION PLAN REPEALS AND WEAKENS CRITICAL CLEAN AIR ACT PROTECTIONS

The Administration's bill takes with one hand while it also takes with the other. In addition to allowing more pollution than needed to protect public health or allowed by current law, the Administration's bill repeals or weakens each of the specific programs and requirements in the current Clean Air Act that are effectively reducing power plant pollution today and that will reduce it further tomorrow.

The repealers, exemptions and weakening provisions in the Administration's bill do great damage to fundamental precepts of the Clean Air Act that have helped deliver cleaner air for over thirty years.

- The current law requires cleanup of polluted areas as quickly as practicable but the Administration's plan would grant automatic delays to 2015.
- The current law requires new sources locating in polluted areas to meet state-of-the-art pollution standards and avoid making existing health problems worse but the Administration's plan would exempt all sources (even those not covered by any cap) from those requirements until 2015, allowing more than a decade's worth of new pollution sources to make air quality worse.
- The current law gives States victimized by interstate pollution effective rights to remedy that pollution but the Administration's plan makes those remedies ineffective against power plants and prohibits any reductions from power plants under these provisions until 2012.
- The current law requires new and modified power plants to limit pollution increases to avoid turning clean air areas into polluted areas but the Administration's bill repeals this safeguard except for a narrow 30 mile circle around certain national parks and wilderness areas.
- The current law requires new and modified power plants to meet up to date emission performance standards to protect areas with clean air but the Administra-

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[17]Clean Air Act §7412(n)1)(A) provides that EPA shall issue MACT standards for power plants if the Administrator determines, after a study, that such standards are "necessary and appropriate." The Administrator made this determination for power plant emissions of mercury in 2000. 65 Fed. Reg. 79,825 (December 20, 2000).

[18]Puruant to a consent decree in NRDC v. EPA, et al., Case No. 92–1415 (D.C. Circuit), EPA is required to propose a mercury MACT standard by the end of 2003, and to promulgate the standard by the end of 2004.

[19]Clean Air Act §7412(i)((3)(A). Under certain circumstances, EPA may allow a specific facility one extra year for compliance. Id. §7412(i)((3)(B).

[20]U.S. EPA, "Discussion of Multipollutant Strategy, Meeting with Edison Electric Institute" (Sept. 18, 2001), available at http://cta.policy.net/currentstatus.pdf.

tion repeals this safeguard for nearly all existing plants and replaces it with a more polluting performance standard for new plants.

- The current law requires EPA to adopt rules to minimize toxic pollution from power plants but the Administration's bill repeals most of those requirements and replaces them with a weak performance requirement for mercury that is delayed 10 years from the current law's schedule.

The Administration defends all of these dismantling provisions as eliminating programs that are not required since its plan establishes national caps for certain power plant pollutants. But the current Administration ignores what the first Bush Administration recognized that national caps cannot protect local air quality and must not override the tools that are in the law to protect communities from pollution increases that harm local air quality. Neither the first Bush Administration nor Congress sought to repeal the tools that protect local air quality when the acid rain cap program was enacted in 1990. Repeal of those tools is no more justified now.

Delaying Attainment of Public Health Standards. Section I of this testimony sets forth EPA's legal obligations under the current Clean Air Act to assure the attainment of the national ambient air quality standards for fine particles and ozone (soot and smog) by 2009 at the latest, or sooner ("as expeditiously as practicable").

The Administration's bill would postpone the attainment deadline for the country's unhealthy air areas by 6 years or more. As long as States could show that their polluted areas would attain the smog and soot standards by 2015, those areas would be labeled "transitional" rather than "nonattainment" and be granted automatic extensions of the deadlines to meet health standards.[21] Since the requirement to attain the standards "as expeditiously as practicable" applies only to nonattainment areas,[22] States would be under no obligation to bring air quality into line with the health-based standards any earlier than 2015. In other words, the Administration's bill would force as many as 175 million Americans to breathe harmful amounts of air pollution for at least 6 years longer than current law allows.[23]

By labeling hundreds of polluted counties "transitional" rather than "nonattainment," the Administration's bill also would allow every major industrial source built or modified in those areas to make health problems worse by evading the lowest achievable emissions rate ("LAER") and offset requirements of current law. Under current law, anyone wishing to build or modify a major source of air pollution in a "nonattainment" area must ensure that the source employs state-of-the-art methods to minimize its pollution (LAER) and must offset any added emissions so as not to degrade the already poor air quality in the area.[24] This requirement applies not just to power plants, but to all other major air pollution sources (oil refineries, chemical plants, manufacturing facilities, etc.) as well.[25]

Under the Administration's plan, these health safeguards would no longer apply in areas relabeled as "transitional." In other words, the Administration's bill would make it easier for the owners of oil refineries, chemical facilities, paper mills, and power plants to churn out additional pollution in hundreds of counties where the air is already unhealthy to breathe. It is important to emphasize that while the Administration's plan caps only power plant emissions the bill would create this loophole for all major industrial sources. Amazingly, the Administration has not offered a word of justification for this remarkable assault on the Act's public health safeguards.

Weakening Safeguards Against Upwind Pollution. Pollution from power plants in upwind States is responsible for violations of the soot and smog standards in many downwind States. The delay of attainment deadlines through the "transitional area" scheme described above would assure that many such downwind States receive more pollution transported from upwind areas over the next 12 years. The Administration's bill exacerbates this problem by eliminating, as a practical matter, the rights of downwind States under section 126 of current law to remedy pollution transported from upwind sources. Now that Federal courts have upheld the rights of States to combat interstate pollution, the Administration's bill would effectively eliminate these rights by establishing a series of new, insurmountable tests before a harmed downwind State can gain relief. And even if the State is able to pass these new extreme tests, the bill prohibits any emission reduction from power plants be-

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[21]H.R. 999 I.H. ("Sec. 3. Other Amendments"), at 227 lns. 5–22.

[22]See 42 U.S.C. §7502(a)(2).

[23]Current law permits limited postponement of the 2009 deadline only where the EPA makes an appropriateness determination "considering the severity of nonattainment and the availability and feasibility of pollution control measures." Id. §7502(a)(2)(B). See also id. §7502(a)(2)(C), (D). The Administration's bill does not condition the availability of the 2015 postponement on any such determination. See H.R. 999 I.H. at 227 lns. 5–22.

[24]42 U.S.C. §§7502(c)(5), 7503(a)(2), (c).

[25]Id. §7502(c)(5).

fore 2012, no matter how compelling the case is that the power plants are creating serious health problems that can only be abated with stronger emission controls. Even if EPA itself believes that better controls are warranted and essential, it too is prohibited from requiring any cleanup from power plants before 2012.

Section 3(r)(6) of the Administration's bill amends section 126 of the current Clean Air Act to prohibit EPA from ordering reductions in power plant pollution transported from upwind States unless EPA makes a series of new, onerous findings: EPA must find that every cheaper reduction (in terms of cost per ton of emissions and in terms of cost per microgram of air quality improvement) has already been made from industrial boilers, on-road mobile sources, off-road mobile sources, and any other category identified by EPA.[26]

These provisions would effectively override key court decisions that have upheld EPA's reasonable interpretation of the Act set forth in two rulemakings addressing interstate transport of NOx pollution.[27] These cases upheld EPA's determination to require reduction of upwind emissions that "contribute significantly" to downwind pollution. While it was necessary for EPA to show that these reductions are cost-effective, the agency was not required to show that all other more cost-effective ways to reduce emissions and concentrations had been exhaustively required first.[28] In doing so, the courts upheld EPA's rejection of far more onerous and unmanageable approaches pushed by industry and opposing upwind States.[29]

In particular, EPA found in 1998 that the second approach demonstrating cost-effectiveness per microgram of air quality improvement would be utterly impractical. Furthermore, it would be inconsistent with an emissions trading approach, which requires emissions to be treated as equivalent on a ton-for-ton basis, and cannot work if each ton of emissions must be weighted differently depending on its distance from a particular spot where air quality improvement per microgram is assessed.[30]

In addition to imposing new, essentially insurmountable tests, the bill would block EPA from granting downwind States any relief from upwind power plant pollution until after 2012. This stands in stark contrast to the extremely expedited relief structure of the current Clean Air Act. As EPA has noted:

Section 126 provides a tool for downwind States, the entities with most at stake, to force EPA to confront the issue directly. It also sets up an abbreviated, and hence potentially faster, process to achieve emission reductions. . . . . In contrast [to the SIP process] Congress required very expeditious EPA action on a [section 126] petition and from 3 months up to 3 years for sources to comply.[31]

In an example of "Catch–22," section 3(r)(6) of the Administration's bill states that before giving a State relief from transported pollution from power plants, EPA must first determine that the State has achieved all more cost-effective emissions reductions (on both a per-ton and per-microgram basis) from both on-road and off-road mobile sources. But this places States in an impossible situation, since the Clean Air Act elsewhere preempts States from controlling emissions from on-road vehicles and engines, CAA §209(a), and nonroad vehicles and engines, CAA §209(e).[32]

As EPA has previously recognized, "Congress provided section 126 to downwind States as a critical remedy to address pollution problems affecting their citizens *that are otherwise beyond their control*, and EPA has no authority to refuse to act under this section."[33] But the Administration's legislative response to the problem of transported air pollution is to saddle downwind, polluted States with insurmountable barriers to relief.

Eliminating Safeguards Against Pollution Hotspots. Under the Administration's bill, a power plant can pollute at any level so long as it buys sufficient pollution allowances credits from other plants.[34] The fact that power plant pollution may decline nationwide, however, provides no protection to the communities affected by a

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[26]See §3(r)(6)(D) (adding CAA §126(d)(2)(B)(i) & (ii)).

[27]63 Fed. Reg. 57356 (Oct. 27, 1998) (NOx SIP Call rulemaking); 64 Fed. Reg. 28250 (May 25, 1999) and 65 Fed. Reg. 2674 (Jan. 18, 2000) (Section 126 rulemakings).

[28]See Michigan v. EPA, 213 F.3d 663 (D.C. Cir. 2000) (upholding NOx SIP Call approach); Appalachian Power Co. v. EPA, 249 F.3d 1032 (D.C. Cir. 2001) (upholding same approach in section 126 rulemaking).

[29]See Michigan, 213 F.3d at 675–680; Appalachian Power at 249 F.3d at 1044–1051.

[30]U.S. EPA, "Rulemaking for Section 126 Petitions—Responses to Comments Which are Outside the Scope of the June 24, 1999 Notice of Proposed Rulemaking," Docket A–97–43, XII-A–01, 65 Fed. Reg. 52931 (Aug. 31, 2000).

[31]65 Fed. Reg. 2674, 2681 (Jan. 18, 2000).

[32]States may control these mobile sources of emissions only by adopting California standards. CAA §§177 & 209(e)(2).

[33]65 Fed. Reg. at 2681/1 (emphasis added).

[34]H.R. 999, ("Sec. 403. Allowance System") at 14 ln. 15 15 ln. 18.

plant whose emissions stay the same, or even increase, because of its owner's reliance on emissions trading. The "New Source Review" (NSR) provisions in the Clean Air Act provide important protection against the emergence of "pollution havens" or "hotspots" in response to an emissions trading system. NSR requires any person planning to build a new major pollution source, or to change an existing one in a way that will cause an emissions increase, to demonstrate that the source will use the most effective pollution control methods available and that its emissions increase will not degrade air quality either locally or in downwind communities[35] or national parks.[36]

The Administration's bill would eliminate Federal New Source Review provisions for power plants, however.[37] If the bill were enacted, a company would be free to cause even massive pollution increases by building a new plant or expanding an old one without adopting up-to-date pollution controls or determining whether air quality will get worse locally or downwind.

To replace the Federal NSR program, the Administration's bill calls on States to submit State Implementation Plan (SIP) revisions to create a new and less protective State New Source Review program. The bill sets no deadlines for these SIP revisions. The bill does not clearly provide that the public must have an opportunity to comment on a permit application. The bill authorizes new loopholes for such State programs that would allow existing power plants to increase emissions by tens of thousands of tons each with no public process. And the bill exempts existing and new power plants everywhere in the country (except within a narrow 30-mile circle around national parks) from the current law's safeguards for clean air areas.

Replacing Up–To–Date Technology with Obsolete Standards. In place of repealed requirements for case-by-case determination of up-to-date pollution control performance, the Administration's bill would substitute a requirement that EPA establish certain emissions standards that would apply to new power plants.[38] The bill sets these standards at much more polluting levels, however, than the emissions levels of plants being built today. In other words, these standards are already obsolete and behind the curve of current requirements. For example:

For boilers and integrated gasification combined cycle ("IGCC") plants, the bill sets a SO_2 emissions limit of 2.0 lb/MWh.[39] Three recently issued permits for coal-fired boilers set SO_2 emissions limits of 1.0, 1.2, and 1.0 lb/MWh, respectively.[40]

For boilers and IGCC plants, the bill sets a NOx emissions limit of 1.0 lb/MWh.[41] Three recently issued permits for coal-fired boilers each set NOx emissions limits of 0.7 lb/MWh.[42]

For boilers and IGCC plants, the bill sets a PM emissions limit of 0.2 lb/MWh.[43] Three recently issued permits for coal-fired boilers set PM emissions limits of 0.12, 0.15, and 0.15 lb/MWh, respectively.[44]

The bill does not place any obligation on EPA to update these already-obsolete emissions standards until 8 years after the agency incorporates them into its regula-

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[35]42 U.S.C. §§7475, 7501–7503. Current law requires a company to demonstrate that the planned construction or other change will not cause or contribute to pollution in excess of certain maximum allowable increases and maximum allowable concentrations that are separated from the NAAQS by a safety margin. 42 U.S.C. §7475(a)(3)(A). The administration's bill simply requires a demonstration that the planned activity will not cause or contribute to a violations of or inability to achieve the NAAQS itself. H.R. 999 I.H. (Sec. 483(c)(1), (2)) at 224 ln. 15 225 ln. 8.

[36]Current law requires a company to demonstrate that the planned construction or other change will not degrade visibility or other air quality related values at any national park. 42 U.S.C. §7475(a)(5), (d). If the administration's bill were enacted, such a demonstration would not be required unless the plant in question were located within fifty kilometers of a park. H.R. 999 I.H. (Sec. 483(b)) at 224 lns. 8–14. This despite the fact that emissions from major pollution sources have been shown to have a negative impact on parks as far as 700 kilometers away. See Gebhart, K., "Preliminary Particulate Sulfur Source Attributions for BRAVO by Trajectory Mass Balance Regressions" (presentation for BRAVO conference call on November 21, 2002) (analysis on file with the Clean Air Task Force).

[37]See H.R. 999 ("Sec. 483. Exemption from Major Source Preconstruction Review Requirements and Best Available Retrofit Control Technology Requirements") at 223 lns. 10–14 ("An affected unit shall not be considered a major emitting facility or major stationary source, or a part of a major emitting facility or major stationary source for purposes of compliance with the requirements of parts C and part D of title I.").

[38]Id. (Sec. 481(b)(1), (c)(1), (d)) at 205 lns. 1–9, 207 ln. 9 211 ln. 7.

[39]Id. (Sec. 481(c)(1)((A)) at 207 lns. 17–18.

[40]Wygen 2 plant in Wyoming; Roundup plant in Montana; IPP plant in Utah.

[41]H.R. 999 (Sec. 481(c)(1)(B)) at 207 lns. 19–20.

[42]Wygen 2 plant in Wyoming; Roundup plant in Montana; IPP plant in Utah.

[43]H.R. 999 (Sec. 481(c)(1)(C)) at 207 lns. 21–22.

[44]Wygen 2 plant in Wyoming; Roundup plant in Montana; IPP plant in Utah.

tions.[45] Even then, the bill gives the agency discretion to avoid reviewing and updating the standards.[46]

This is a sharp contrast with current law, under which the case-by-case review of LAER and (in areas other than nonattainment areas) "best available control technology" (BACT) assures that emission performance for new and modified plants keeps pace with improvements in pollution control capabilities. Because of BACT and LAER, the state-of-the-art in industrial pollution control has repeatedly graduated to successively higher levels of environmental performance as sources were built or modified over the last two decades.

For example, a review of EPA's data base for BACT and LAER determinations reveals that over just the past 10 years, the state-of-the-art in NOx emissions controls for utility boilers and furnaces has advanced from no controls ("good combustion practices") to low NOx burners to selective catalytic reduction ("SCR") to selective non-catalytic reduction ("SNCR") and circulating fluidized bed ("CFB").[47] Recent determinations by permitting authorities show that further improvements are in the wings.[48]

As EPA and the courts have recognized, Congress intended the Clean Air Act to perform this "technology-forcing" function.[49] The Administration's bill erases that function, leaving in its place static emissions standards that do not even represent the state-of-the-art in pollution control today.

EPA Assistant Administrator Holmstead has acknowledged in testimony delivered before this committee that the New Source Review requirements have not adversely impacted construction or investment associated with new power plants. He testified that:

With regard to the energy sector, EPA found that the NSR program has not significantly impeded investment in new power plants or refineries. For the utility industry, this is evidenced by significant recent and future planned investment in new power plants.[50]

This committee should recall that in 1990, the first President Bush did not seek to repeal these safeguards when he sought a cap and trade program for SO_2 from power plants and Congress did not enact such a repeal. Those programs have worked in tandem for the past 13 years. The Act's safeguards for local air quality have not interfered with the acid rain cap and trade program and have not prevented the very large economic savings provided by the cap and trade mechanism. Experience proves that both programs can work together and this Congress should not ignore that fact.

Eliminating Protections for National Parks. The Administration's bill would exempt owners of new and modified power plants from the obligation to meet up to date pollution performance standards (BACT) and examine the impacts of any added pollution on national parks or wildernesses—called "Class I areas"—(except those within 30 miles of the plant). The bill also eliminates the role of the Federal land manager (typically the National Parks Service superintendent for a national park) in assuring that the air quality of these treasured lands is protected.

Under current law, if a new or expanded pollution source could affect a Class I area, the Federal land manager has an opportunity to review the draft permit and an accompanying air quality analysis to assure that factors relevant to protecting national parks and wilderness areas are taken into consideration, and that harmful effects are mitigated. The Federal land manager's review would be eliminated under the Administration's bill for all plants outside the 30 mile cordon around each park or wilderness.

The Administration's bill would also repeal the current Clean Air Act program to lift the haze shrouding the nation's parks by obligating the States to require the best available retrofit technology ("BART") on all major sources of air pollution built

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[45]H.R. 999 (Sec. 481(e)(1)) at 211 lns. 8–18.

[46]Id. (Sec. 481(e)(2)) at 212 lns. 3–8.

[47]See http://cfpub1.epa.gov/rblc/cfm/basicsearch.cfm.

[48]See, e.g. Letter from Richard L. Goodyear, permit programs manager, State of New Mexico Air Quality Bureau, to Larry Messinger, Mustang Energy Company (December 23, 2002), at 1–2 ("The analysis must include a discussion of the technical feasibility and availability of IGCC and CFB for the proposed site in McKinley County . . . .").

[49]See "Background Statement on the Environmental Protection Agency's Top-Down Policy" (June 13, 1989) (citing S. Rep. No. 95–252, 95th Cong., 1st Sess. 31 (1977)), reprinted in, 3 A Legislative History of the Clean Air Act Amendments of 1977 at 1405; 123 Cong. Rec. A9171 (remarks of Senator Edmund G. Muskie), reprinted in 3 Legislative History at 729. See also WEPCO v. EPA, 893 F.2d 901, 909 (7th Cir. 1990).

[50]Testimony delivered Assistant Administrator Jeffrey Holmstead to the U.S. Senate Committee on Environment and Public Works on July 16, 2002.

between 1962 and 1977 that contribute to the haze.[51] The Administration's bill exempts all power plants the primary contributor to park haze from the BART requirement.[52] In so doing, the bill lets off the hook those intransigent companies that have not yet installed the best available retrofit technology on their plants.

If the Administration elected to enforce the requirement, instead of lifting it, the installation of BART on just the largest power plants would reduce annual SO_2 emissions by 4.5 million tons, and annual NOx emissions by 1.9 million tons.[53] Those reductions alone would be equivalent to what the Administration's bill would purportedly achieve in its entire 8–10 year first phase.

Eliminating Protections for Other Areas With Clean Air. The Administration's bill weakens air quality safeguards across the rest of the country. Except in the 30 mile cordon around our national parks and wildernesses, the bill eliminates any case-by-case review of proposed new power plants anywhere in the country. Under current law, plants locating in the vast majority of the country areas classified as "Class II PSD areas," with air quality better than the national health standards must undergo New Source Review and demonstrate that they will be equipped with "best available control technology" (BACT) and will not cause excessive degradation of air quality ("pollution increment consumption") in the surrounding area. And, as already mentioned, plants locating in nonattainment areas must meet the "lowest achievable emission rate" (LAER) and must offset any additional pollution.

The Administration's bill repeals these requirements, creating a vacuum where there is no federally enforceable obligation for new or modified power plants to provide anyone with notice of their intent to build or expand, no requirement to review air quality impacts, and no requirement to case-by-case review of emission control performance. The only requirement would be to meet the obsolete national standard described above.

Weakening Safeguards Against Hazardous Air Pollution. I have already described how the Administration's bill would repeal the current Clean Air Act's requirement for applying "maximum achievable control technology" (MACT) to power plants to curb their mercury emissions. The bill requires no mercury controls until 2010 (a 2-year delay over the current law) and substitutes much weaker mercury caps in place of the plant-by-plant MACT requirement. For 2010 through 2017, the bill's 26 ton cap represents merely the mercury reductions incidental to the bill's phase-one caps for SO_2 and NOx. Mercury cuts beyond these incidental reductions are not achieved until 2018. In other words, the Administration's 3-pollutant bill is effectively a 2-pollutant bill until 2018.

Also repealed with mercury MACT is the current law's requirement that EPA establish MACT standards for all hazardous air pollutants emitted by power plants, not just mercury. For hazardous pollutants other than mercury, the bill leaves only the authority to set "residual risk" standards through a complex risk-based process, but the earliest that those regulations are permitted to take effect is 2018 a full 11 years after the MACT compliance deadline of the current Clean Air Act. Moreover, the bill repeals the Clean Air Act's "residual risk" protections entirely for mercury without regard to any health risks that remain under the bill's weaker mercury caps.[54]

The Administration's bill allows unrestricted emissions trading of mercury, something never before allowed under the Clean Air Act for a hazardous air pollutant. The current Clean Air Act requires mercury reductions at each power plant, based on the emissions reductions achievable through advanced technologies applied to individual emissions units. By allowing mercury trading, the bill would allow some power plants not to reduce their emissions at all. Instead, they could buy mercury emission allowances from other power plants and do nothing to stop contamination of local lakes and streams. Some plants could even increase their mercury emissions.

Indeed, EPA's own analyses of the Administration's bill acknowledge mercury pollution increases above today's levels from "specific sources in some States," due to the trading features of the bill and the bill's repeal of the 2007 MACT standard.[55] This dirtier outcome would not be allowed if the plant-specific MACT standard were to remain in effect. EPA's data also show that parts of New England, the Great

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[51]42 U.S.C. §7491(b)(2)(A).

[52]H.R. 999 (Sec. 483(a)) at 223 lns. 10–18.

[53]MSB Associates, analysis using EPA list of BART eligible sources exceeding 750 MW (analysis on file with the Clean Air Task Force).

[54]§3(a)(5).

[55]See U.S. EPA, "Technical Support Package for Clear Skies," Section B: Human Health and Environmental Benefits, at 44.

Lakes, Gulf Coast region and other areas will receive only very small reductions in mercury deposition under the bill.[56]

Because unrestricted trading of mercury emissions could lead to toxic hotspots where mercury contamination increases, the Clean Air Act as well as other legislative proposals (notably the Clean Power and Clean Smokestacks Acts)—bar trading in mercury emissions. Hotspot risks under the Administration's bill are made worse by the fact that the bill does not require continuous emissions monitoring (CEMS) for mercury. EPA itself has identified continuous monitoring and reporting as design features essential to the environmental integrity of the acid rain trading program.[57] Mercury emissions trading is allowed even without continuous monitoring so long as the Administrator determines that "CEMS for mercury with appropriate vendor guarantees are not commercially available."[58] The responsible approach would be to make any mercury trading (if some carefully limited program were shown to prevent hotspots) contingent on the development of reliable continuous monitoring systems for the pollutant.

III. THE ADMINISTRATION BILL ALLOWS UNLIMITED GROWTH IN CARBON DIOXIDE FROM POWER PLANTS, WORSENING GLOBAL WARMING

As you know, even though electric power plants are responsible for 40 percent of U.S. carbon dioxide (CO_2) emissions, the Administration's bill does not contain any provision to reduce or even limit the growth in these emissions. This feature of the Administration's bill is not just an omission; it is a serious affirmative mistake that will make it more difficult for the U.S. to take responsible action in the near future to begin addressing the real dangers of global warming.

The Administration's bill would set in motion major capital expenditures at existing power plants over most of the next two decades. To implement such a program without addressing CO_2 emissions is to invite shortsighted investment decisions and promote even greater resistance to proposals to limit CO_2 when we do decide to act. A choice to ignore CO_2 emissions in a power plant bill is not just a choice to leave this decision open for tomorrow. It is a decision that will raise the cost and difficulty of beginning to address the nation's largest source of global warming pollution.

Such a choice is not responsible. Delay will turn what is still a manageable threat into a runaway, unmanageable problem. In the national security context, the current Administration has no difficulty understanding that waiting until a danger has fully developed runs the risk of foreclosing our ability to avert that danger. This logic applies strongly to the danger posed by global warming. If we wait until this danger has fully developed, it will be too late to prevent.

Global warming is a problem that has enormous built-in inertia. The most important global warming gas, CO_2, stays in the atmosphere for hundreds of years. The largest sources of CO_2, fossil-fueled power plants, have lifetimes of 50 years and more. Managing the threat of global warming is like navigating a supertanker to avoid running aground we have to start altering course long before we arrive at the reef. While in the global warming context we may not have identified exactly how close we are to the reef or how severely our ship will be damaged from striking it, it is a fact that if we steam ahead with our current energy systems until we have all the evidence required to satisfy the skeptics, we run very large risks of locking ourselves into very large-scale unavoidable damage.

We are already unalterably committed to a future in which the concentration of global warming gases will be substantially higher than pre-industrial levels. To avoid reaching concentrations that are several times pre-industrial levels, we will need to change the technology we use to generate power and for transportation. In the decision whether to include CO_2 in a power plant emission control bill, this Congress will either stimulate investors to get serious about developing and using new climate-friendly power technology or it will send a signal to procrastinate.

Advocates of delay argue we should not act until we know exactly how sensitive the climate is to added CO_2 and exactly how harmful a given temperature rise will be. Unfortunately, we cannot put the world on "pause" while we do more research. We cannot afford to wait for resolution of these uncertainties before we begin to change energy investments. The CO_2 we emit may cause a temperature rise at the high end of published estimates, the low end, or in between; the damage done by a specific temperature rise also may be larger or smaller. But once we know for

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[56]Id.

[57]Testimony of Jeffrey Holmstead, Assistant Administrator, Office of Air & Radiation, U.S. EPA, Before the Subcommittee on Public Health of the Committee on Health, Education, Labor and Pensions, U.S. Senate, at 4–5, September 3, 2002.

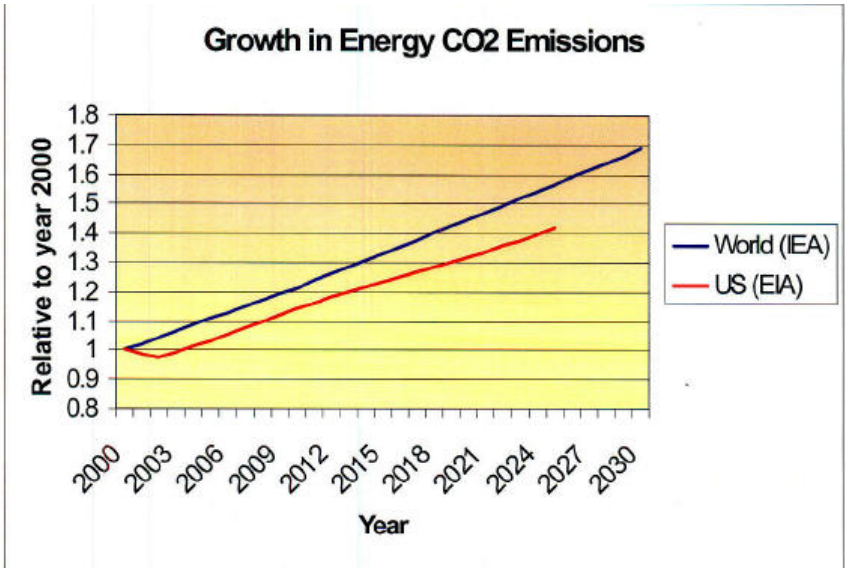
[58]§405(a)(2)(B)(ii).

sure, it will be too late to change course. The fact is that continuing on our current path will commit us to an outcome that we will not be able to undo.

A paper by Ken Caldeira and colleagues published 2 weeks ago in Science magazine demonstrates the danger of continued procrastination. Using mid-range estimates of climate sensitivity, the authors conclude that we would need to be building the equivalent of about 20 CO_2-emission-free power plants a week worldwide, starting now, to keep global temperatures from increasing more than 2 Centigrade.[59] Consider that global temperature in the last ice age was 5 C cooler than today and you can appreciate that 2 would be a very big change. On our current path, however, the world is on track to add the equivalent of less than 2 CO_2-emission-free plants per week between now and 2030[60]. The authors go on to demonstrate that even assuming a best-case outcome for these uncertainties, we still need a massive increase in CO_2-emission-free energy resources compared to current forecasts.

Today people talk about the need to design climate policy to avoid "premature retirement" of existing capacity. But tomorrow's "existing" capacity is being designed and financed today and it is not being designed to be climate friendly. Policy procrastination just locks us in to more high-carbon capacity that will either have to be retired "prematurely" or will emit amounts of CO_2 that could make it impossible to stabilize concentrations of global warming emissions at safe levels.

The U.S. Energy Information Administration forecasts that the United States will build the equivalent of over 1350 medium-sized fossil energy power plants between now and 2025 (405,000 MW).[61] The path we are on today will result in skyrocketing emissions of CO_2 in the U.S. and globally. Figure 9 shows current forecasts for the U.S. and the world over the next 25–30 years: U.S. emissions are projected to increase by 40 percent and world emissions by nearly 70 percent over year 2000 levels. These emissions will stay in the air for hundreds of years making the task of protecting the climate that much harder and more expensive.



The Need to Set Real Policies Now

The problem of delay is particularly intense with respect to the electric power sector. As we know, power plants have extremely long lives. There are plants in the U.S. more than 60 years old that are still operating today. New plants built in the next decade or two will be operating in the third quarter of this century, and their cumulative emissions will determine how much the climate warms. While we procrastinate, energy demand keeps growing and more investments are made in power plants that are no less carbon-emitting than yesterday's plants.

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[59]K. Caldeira et al., "Climate Sensitivity Uncertainty and the Need for Energy Without CO2 Emission," Science 299, 2052 (2003).

[60]International Energy Agency, World Energy Outlook 2002, October 2002.

[61]U.S. Energy Information Administration, Annual Energy Outlook 2003.

Which brings us to the choice before you. Including provisions to limit CO_2 in a power plant bill can speed the process of bringing advanced technologies to market; leaving CO_2 out will keep that activity on the back burner. Analyses discussed in NRDC's testimony to the full committee in June 2002 show that it is possible to craft legislation that limits power plant CO_2 with modest impacts on the economy.[62]

The Administration and many in Congress have resisted including a binding limit on CO_2 in power plant legislation out of an apparent belief that any binding cap will have unacceptable impacts on electricity rates and fuel diversity. That is not correct.

For example, even the Administration's own analyses conclude that some versions of binding CO_2 caps would have very modest impacts on electricity rates and fuel use, even when using a number of conservative (and we believe, flawed) assumptions.[63] In September and October 2001, both EPA and EIA analyzed a binding carbon cap for the electric sector using a set of requirements specified by Chairman Voinovich, former Senator Smith, and Senator Brownback.[64] Among the scenarios examined by EIA and EPA were requirements to cut SO_2, NOx, and mercury emissions by 75 percent from 1999 levels in two stages (2007 and 2012) and to cap power sector CO_2 emissions at forecasted 2008 levels.[65]

EIA's report calculated this set of requirements would result in an average electricity rate of 7.1 cents per kwh, compared to a 1999 average electricity rate of 6.7 cents per kwh. EIA projected coal consumption in 2020 would be the same as in 1999.[66]

While power sector CO_2 emissions need to decline below 2008 levels, the key point is the need to set a schedule now for limiting and then decreasing emissions of CO_2. By adopting a schedule now, you can provide the maximum lead-time for the industry and achieve long-term reductions at the most gradual rate of change. By adopting a schedule for limiting carbon emissions you put market forces to work to deliver the clean energy resources we will need to meet economic growth without disrupting the climate that strongly influences the quality of life in our country and others around the globe.

We can do three things to limit carbon emissions from energy use. First, produce and use energy more efficiently. Second, dramatically increase our reliance on renewable energy resources. Third, pursue methods to capture and permanently store CO_2 from the fossil energy sources we continue to use. All three of these methods will be stimulated by adopting a program to limit CO_2 emissions from the power sector. All three will languish if Congress ignores CO_2 in a power plant bill.

Members of this committee and others in Congress are concerned about the impact of climate policy on coal. The U.S. and other large countries, including China, India, Russia (to mention just a few) have abundant coal resources. While coal and other fossil fuels have continuing environmental impacts, including global warming emissions, the reality is that large amounts of coal will continue to be used.

Fortunately, technologies in commercial operation today demonstrate it is feasible to capture CO_2 from coal-based power plants in a form that can be kept out of the atmosphere provided that suitable geologic repositories are developed. As I mentioned in my June 2002 testimony to the full committee, in the U.S. today we inject over 30 million tons of CO_2 annually into oil fiqelds to recover additional oil. Yet, none of that CO_2 is supplied by power plants. Rather it is pulled out of natural CO_2 reservoirs and piped hundreds of miles to be stuck back in the ground.

Because industrial CO_2 can still be emitted to the air in unlimited amounts for free, there is not an adequate economic incentive to use and optimize existing technology to capture these emissions. Nor is there an adequate incentive to invest to bring down the costs of today's gasification and CO_2 capture systems.

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[62]See Testimony of David G. Hawkins on S. 556, June 12, 2002.

[63]A number of flaws in the administration's analyses of "four-pollutant" bills are described in NRDC's testimony of June 12, 2002 at the full Committee hearing on S. 556, the Clean Power Act. Testimony of David G. Hawkins at 12–16.

[64]Energy Information Administration, "Reducing Emissions of Sulfur Dioxide, Nitrogen Oxides, and Mercury from Electric Power Plants," September 2001. ("EIA S-V-B report") and U.S. EPA, "Analysis of Multi-Emissions Proposals for the U.S. Electricity Sector," October 2001.

[65]Letter of June 8, 2001 from Senators Smith, Voinovich, and Brownback to John Weiner, EIA, reproduced in EIA S-V-B report at Appendix A. Compliance with the CO2 cap could be achieved with on-system reductions or credits for "sinks" enhancements or reductions from other source categories. EIA's report calculated costs assuming that only CO2 emission reductions from U.S. energy facilities would be used for compliance.

[66]While this result represents a decrease in coal consumption from no-control forecasts, EIA's report assumed no penetration of coal-gasification technology in the electric sector, even by 2020. This is inconsistent with the Department of Energy's programmatic goals for this technology. EPA's report on the S-V-B scenario forecasts smaller price and fuel impacts than EIA's, due to EPA's broader assumed trading options than EIA assumed.

Ironically, the current policy procrastination has made the U.S. coal industry's posture a very uncertain one. No one believes that action on global warming can be delayed indefinitely and this causes investors to be leery of large new investments in conventional coal-fired power plants. On the other hand, without a policy resolution, setting forth a program to limit CO_2 emissions over time, the uncertainty is too great for most investors to develop and plan to deploy advanced coal technologies like gasification and capture systems.

In sum, failure to include CO_2 limits in a power plant bill has real costs. It would keep the U.S. and the world on a path of accelerating CO_2 emissions a path that is unacceptably risky given what we already know about the potential of global warming to change our lives for the worse. It would steer investments at the margin to patching up old, existing capacity that should be replaced with modern, efficient systems. And it would continue the policy uncertainty that operates as an obstacle today to business planners considering what energy investments they should pursue.

The good news is that by acting now to adopt a schedule for limiting CO_2 emissions we can change behavior and make it easier to address global warming. For example, the International Energy Agency forecasts that nearly the world will build new coal plants equal to nearly five times the current U.S. coal plant capacity between now and 2030.[67] While seemingly a daunting prospect, this projection really means that two out of every three coal power plants forecasted to be operating in 2030 are not yet designed or built. With U.S. leadership, we can design new energy projects to rely on climate-friendly technology. Doing so will expand our options to reconcile aspirations for improved economic well-being around the world while preserving the climate we all depend on to provide us with a hospitable place to live.

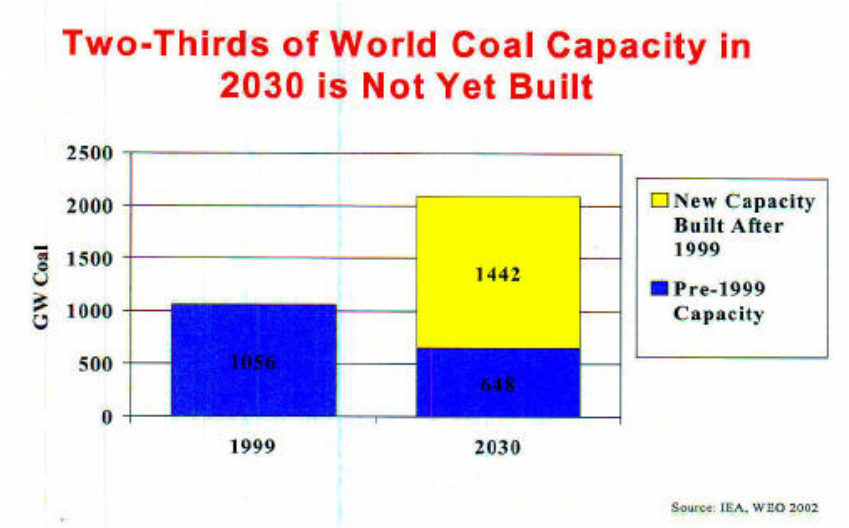


FIGURE 9[68]

In conclusion, let me suggest it is time for all sides to stand down from the posturing of past years on this issue and adopt a more pragmatic approach. There are many sensible policies that can be adopted to start limiting CO_2 emissions and there are many compelling reasons to do so. Working together, members of both parties and the Administration would be able to identify a path forward that all could embrace and all could point to as a real accomplishment. NRDC will work with you to help make that happen.

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[67]IEA, World Energy Outlook 2002, October 2002.

[68]GW=gigawatt, which is 1000 MW of capacity. Current U.S. coal capacity is just over 300 GW.

STATEMENT OF EUGENE TRISKO, UNITED MINE WORKERS OF AMERICA

Mr. Chairman and members of the committee: I am Eugene M. Trisko, an attorney in the District of Columbia. I am pleased to be here today to testify on behalf of the United Mine Workers of America (UMWA), the labor union representing the nation's organized coal miners. I have worked with the UMWA for some 20 years on issues related to the Clean Air Act and global climate change, including the development and implementation of the Clean Air Act Amendments of 1990, the Byrd–Hagel climate resolution, and the proposed Clear Skies Act.

The UMWA supports additional reductions in sulfur dioxide (SO_2), nitrogen oxides (NOx) and mercury from coal-fired power plants, provided that the reductions are achieved in a way that preserves coal miners' jobs. UMWA members mine, process and transport coal in their daily jobs. Their economic interests are entwined with energy and environmental issues in a very direct manner.

Since 1990, the UMWA has lost thousands of coal mining jobs as a consequence of fuel-switching in response to the acid rain provisions of Title IV. Coal production in major eastern coal producing States declined by more than 113 million annual tons between 1990 and 2000, while more than 30,000 coal mining jobs were lost. Most of these reductions and job losses were the result of switching from higher- to lower-sulfur coals to meet the emission reductions required by Title IV. Dozens of mining communities have all but ceased to exist across economically depressed Appalachia and the rural Midwest. The union is understandably sensitive to the risk of additional job losses through new multi-emission legislation.

For these reasons, the UMWA appreciates the concerns that the Administration has expressed toward its members' interests in the development of the proposed Clear Skies Act, and is gratified that the proposal reflects UMWA's suggestions about the need for incentives to encourage the early installation of control technologies. Our statement today is intended to point out some remaining concerns about the design of multi-emission legislation.

Background: The Role of Coal in America's Energy Supply

Coal is an indispensable part of America's energy supply. The U.S. has a demonstrated coal reserve base of over 500 billion tons, with an estimated 275 billion tons of recoverable reserves. At current production rates, this represents about 275 years of recoverable reserves.

Coal represents some 95 percent of all U.S. fossil fuel energy reserves. About one-quarter of global known coal reserves are found in the United States. U.S. recoverable coal reserves have the energy equivalent of about one trillion barrels of oil, an amount comparable to the world=s known oil reserves.

More than one-half of our nation's electricity is generated by coal. To back coal out of our energy supply mix means that we would have to find another fuel to replace it, most likely natural gas. Such a fundamental shift in U.S. energy policy would bring into question not only the cost but also the availability of natural gas supplies. Substantial increases in demand for natural gas inevitably would lead to higher costs and greater dependence on foreign sources for supply. At the margin, our gas supplies are imported from Canada and other sources in the form of LNG.

Natural gas futures prices now exceed $4 per million BTU at the wellhead, and persist at that level for contract purchases several years into the future. Gas prices exceeded $10 per million BTU in many markets this winter. Environmental policies that drive electric utilities away from coal which costs about $1 per million BTU at the mine—and toward natural gas conflict with our energy policy goals of maintaining a reliable, low-cost mix of generating sources.

The UMWA also recognizes that Americans demand a cleaner environment at the same time they demand low-cost, reliable and available energy. For coal to continue to play the vital role that it can and should play in our energy mix, we must ensure that coal is consumed with minimum emissions consistent with the use of available technologies. The United States must continue to develop highly advanced technologies to convert coal to a cleaner and more efficient form of energy.

The UMWA Supports a Three–Pollutant Approach

The UMWA supports in principle the emission reduction tonnage targets contained in the proposed Clear Skies Act. The UMWA has some suggested changes intended to improve the environmental effectiveness of the proposal, while reducing the risk of large-scale, disruptive fuel-switching.

The union consulted with the Administration during the development of the Clear Skies Act. UMWA engaged this issue in August 2001 in response to the release of EPA's initial "strawman" proposal, calling for, inter alia, a 2.0 million ton cap on sulfur dioxide emissions to be achieved by 2010. Through a process of inter-agency negotiations, that proposal was modified to a two-phase program with a 3.0 million

ton final cap. The UMWA supported the 3.0 million ton final cap, but argued for a single-phase program.

The positions that UMWA has taken on the Clear Skies Act can be summarized as follows:

1) A single phase approach to reducing SO_2 emissions can be developed in a manner that reduces the risk of fuel-switching by encouraging extensive use of available emission control technologies, thereby maximizing the "co-benefits" of mercury reductions;

2) Two-phase proposals for SO_2 control may encourage fuel-switching and resulting job losses, while reducing the use of control technologies that also achieve mercury reductions;

3) A 2.0 million ton cap on SO_2 emissions is excessively stringent and could lead to the shut-down of smaller units forced to install emission controls;

4) Differentiating NOx control requirements between eastern and western States makes sense in light of OTAG modeling results showing the minor contribution of western NOx emissions to ozone affecting eastern States; and

5) An initial target for mercury reductions should be set based on expected "co-benefit" reductions from a single-phase SO_2/NOx control program, with a subsequent target based on the results of these reductions, and advances in available mercury control technologies.

In November 2001, UMWA President Cecil E. Roberts testified before this committee:

"An SO_2 and NOx control plan along these lines could be implemented as a first step in a longer-range plan to reduce mercury emissions. The experience in mercury "co-benefits" achieved by the first phase controls for SO_2 and NOx emissions would be vital in assessing the feasibility of ultimate mercury reduction targets. In light of this, the committee may want to consider early reduction allowances for SO_2 controls that also reduce mercury emissions on the theory that such reductions are more valuable than those strategies that only reduce SO_2 alone. There is precedent for such extra credit in Title IV of the 1990 Amendments, which allocated 2:1 bonus allowances to utilities that chose to install control technology."

With this background, the UMWA respectfully requests the committee to consider constraining the eastern SO_2 reductions called for by the Clear Skies Act to a single phase control program with a reasonable final deadline, perhaps similar to the 10-year deadline provided by the Title IV SO_2 control program.

A single-phase SO_2 program would serve to maximize the use of emission control technologies such as flue gas scrubbers that also reduce mercury. More important, emission reductions would be achieved in time to assist States in attaining the new $PM_{2.5}$ standard. A longer-term, two-phase program may not deliver sufficient reductions in time for States to demonstrate attainment by the expected 2015 attainment deadline.

Because NOx controls tend to be added incrementally, from low–NOx burners to selective catalytic reduction, there is less need for a single-phase NOx control program. The targets and timetables for NOx reductions also may take into account the longer-term attainment schedule for the 8-hour ozone standard that EPA is developing, modeled on the 17-year schedule that Congress approved for the 1-hour ozone standard.

Eliminate Allowance Auctions

The UMWA urges elimination of the emission auction provisions of the Clear Skies Act. Requiring sources both to reduce emissions and to pay for auctioned allowances is a form of double taxation whose rates rise in relation to the sulfur content of coal. Auction "tax rates" would be highest in West Virginia, Pennsylvania, Ohio, Kentucky, Indiana, Illinois and other States producing higher-sulfur coals. Over time, this new energy tax would create a major disincentive to the use of coal reserves in these States.

Avoid Entanglement with Climate Issues!

The UMWA does not support reduction schemes that force or encourage electric utilities to switch away from coal, thereby causing economic harm to coal miners and their communities. UMWA is particularly concerned that efforts to craft new multi-emission control legislation should remain focused as the Clear Skies Act is—on reducing the air pollutants contributing to air quality problems such as non-attainment with EPA's new 8-hour ozone and $PM_{2.5}$ standards.

The union is strongly opposed to efforts to use the Clean Air Act as a vehicle for regulating greenhouse gas emissions.

Regulating greenhouse gases under the air quality framework of the Clean Air Act is not feasible. It is not possible to set enforceable limits on domestic atmospheric concentrations of greenhouse gases generated and transported globally. Carbon dioxide, the principal greenhouse gas, is not harmful to human health and could not properly be classified as a "criteria" air pollutant.

There are no commercially available means to reduce carbon emissions from the electric generation sector. Limits on carbon emissions would require switching from coal to natural gas or other higher-cost energy sources, with potentially devastating impacts on the economies of coal-producing States.

The Kyoto Protocol exempts rapidly growing developing nations from limits on greenhouse gas emissions, and unilateral actions by the United States to reduce carbon emissions would have no measurable impact on future concentrations of greenhouse gases. Global greenhouse gas concentrations are projected to increase into the foreseeable future, irrespective of ratification and implementation of the Kyoto Protocol. These increases will be driven predominately by the economic growth of developing nations.

The U.N. Framework Convention on Climate Change calls for the United States and other parties to establish global atmospheric greenhouse concentration targets to prevent "dangerous" anthropogenic interference with climate. To date, the U.N. FCCC process has failed to engage this debate. Indeed, the FCCC's "second review of adequacy of commitments" has been stalled since November 1998 when China and other developing nations refused to discuss the adequacy of developing country commitments. In Kyoto, developing countries staged a 6-hour filibuster against the U.S. "evolution" proposal, calling for subsequent negotiation of developing country commitments. These subsequent negotiations were contingent upon full and complete performance of all Annex I country obligations under the Kyoto Protocol.

The deficiencies of the Kyoto Protocol and the U.N. FCCC process should be resolved through multilateral negotiations involving developed and developing countries, potentially leading to a new global agreement on greenhouse gases that recognizes the "common but differentiated" responsibilities of parties to the FCCC, with an equitable apportionment of emission limitation targets among all parties.

The UMWA's concerns about including greenhouse gas emission restrictions within domestic Clean Air legislation are shared by other labor unions. On October 24, 2001, the presidents of seven labor unions conveyed their views on this issue to this committee. A copy of their letter is attached to this statement.

Need to Consider Financial Impacts

The failure of many State utility restructuring efforts and other economic forces have degraded the financial health of the electric utility industry. The industry is littered with companies in or teetering on the edge of bankruptcy. Credit downgrades are daily news.

The multi-billion dollar annual cost associated with new emission control legislation raises questions about the ability of the utility industry to raise needed debt and equity capital. In many States, it is no longer possible to simply pass through the costs of new emission controls to utility ratepayers.

Under these circumstances, UMWA recommends that the committee consult with the congressional Research Service or the General Accounting Office on the financial implications of proposed emission control legislation. Both the tonnage reductions and the timetables for compliance should reflect sound financial and economic assumptions about the ability of the industry to comply.

UMWA appreciates the opportunity to share its views on the proposed Clear Skies Act with the committee, and looks forward to the opportunity for further input to the development of multi-emission legislation as your deliberations proceed.

Thank you.

RESPONSES OF EUGENE TRISKO TO ADDITIONAL QUESTIONS FROM SENATOR VOINOVICH

Question 1. Obviously, fuel switching is an issue that is important to you—as your members will be forced out of their jobs if utilities switch to natural gas as their primary fuel for electricity generation.

How does Clear Skies affect your industry?

Response. EPA's current analyses of Clear Skies show relatively little overall impact on domestic coal production compared to EPA's base case business-as-usual scenario, with a slight shift from western to eastern bituminous coals by 2020. For reference, see Jeff Holmstead's recent article in Electric Perspectives at: http://www.eei.org/ep/editorial/May—03/0503ClearSkies.htm

This shift reflects the increased use of control technologies needed to meet CSA emission targets, and the relative ease of removing mercury from high-chlorine content eastern coals.

UMWA has been advised by EPA staff that the main risks of fuel switching under Clear Skies would exist in the early years of the program, following enactment. Utilities would be able to bank SO_2 allowances against future reduction requirements, and would have a strong incentive to switch to lower-sulfur western coals in order to reduce their current emissions.

Many subbituminous western coals have emission rates of 0.6–1.0 lb SO_2/MMBTU, while there are virtually no eastern coals with a sulfur content less than 1.0 lb. SO_2. The lower the sulfur content of the coal feed, the larger the number of allowances that can be banked relative to the nominal 1.2 lb. allocation formula employed in Title IV, Phase II.

These considerations led UMWA to propose a system of early reduction bonus allowances in Clear Skies, similar to the "Byrd-Bond" amendment to Title IV, which the bill now incorporates. CSA provides 250,000 tons of SO_2 allowances as a set aside for plants that install scrubbers prior to the initial 2010 Phase I cap.

UMWA's initial proposal for this early action program was 500,000 tons of allowances in each of the years 2007, 2008 and 2009. Any increase in the 250,000 ton early action reserve would be helpful in encouraging the early use of control technologies that reduce SO_2 as well as mercury as a cobenefit.

The risk of early fuel switching also underlies UMWA's proposal for a single phase SO_2 control program, as explained in my direct testimony. Such a program would create incentives for early scrubbing to reduce both SO_2 and mercury, and minimize the risks of short-term fuel switching that would not be consistent with preservation of eastern coal mining production capacity.

Question 2. Is Clear Skies better for your industry in the long run than other alternatives—including business as usual, the Clean Power Act (S. 366) and the Clean Air Planning Act (S. 3135)?

Response. Clear Skies is significantly more favorable to coal production and consumption in the long-run than either S. 366 or S. 3135. The principal reason for this is that these alternatives include requirements for carbon emission reductions, which would serve as an impediment to coal use.

For the reasons set forth in my direct testimony, UMWA would not support an amendment to the Clean Air Act including carbon dioxide limits on coal power plants. The international climate change process must first be redirected to embrace all major greenhouse gas emitting nations. Unilateral actions by the U.S. would have no meaningful impact on global concentrations of greenhouse gases, and could impose unacceptable economic hardships on coal producing and consuming States.

Further, as stated in response to the Committee's hearing questions, UMWA welcomes analyses by EPA, EIA or other agencies of the potential fuel market impacts of alternative bills before the Committee.

RESPONSES OF EUGENE TRISKO TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. As it has been explained to me, the future for new coal generation and consumption in the next 20 years or so is pretty dim. According to EIA, most new capacity is going to be natural gas, unless we quickly bring in coal gasification technology. What are the projections for employment in the coal mining field over the next 10 years or so, if cleaner, more efficient coal fired generation is not installed within that period?

Response. EPA and DOE projections for coal mining employment show a general downward trend, reflecting increased productivity. This is a continuation of an historic trend based on increased mechanization at mines. EPA's projections of mining employment for Clear Skies may be referenced at: http://www.epa.gov/air/clearskies/tech—sectiond.pdf

EPA's analysis suggests a small positive increase in coal jobs (900–1,400) due to Clear Skies relative to the reference case in 2005 and 2020. This is mainly due to increased production in the Midwest.

EIA's projections of future natural gas capacity additions may not be realistic in view of recent increases in the wellhead price of gas, and poor experience in finding rates for new gas. A business as usual scenario for coal over the next 10 years reflecting realistic gas price assumptions likely would indicate substantial increases in generation from existing plants, especially those with relatively low capacity factors, in order to supply increased electric demand. This would imply a beneficial impact on coal mining jobs.

Question 2. Do you believe that the current statutory language or the consent decree regarding the MACT requirements for hazardous air pollutants could result in a rule that controls mercury only at the co-benefit level—in the 40–50 percent range per unit?

Response. The statutory language of section 112 will control EPA's determination of an appropriate MACT for coal-fired units. The consent decree impacts only the timing of the proposal and its promulgation as a final rule. The MACT may subcategorize by coal type, and under applicable precedent should reflect consideration of worst case operating conditions.

It is UMWA's understanding that the ICR data collected by EPA can be interpreted to support a MACT that is consistent with a cobenefit level of reduction. The MACT determination under section 112 looks at the performance of the top 12 percent of units, based on controls actually in use. It is unlike a section 111 NSPS determination, which considers what may reasonably be anticipated as state-of-the-art control technology.

Thus, in determining MACT, EPA may not consider the effectiveness of activated carbon injection and other emerging mercury control technologies that are not in actual commercial use. Instead, the agency must focus on the effectiveness of controls in place among its ICR sample of 80 plants.

Because these controls remove mercury as a co-benefit of other emission control technologies for SO_2, NOx and particulates, it is reasonable to expect that EPA's MACT proposal(s) should be consistent with a cobenefit level of mercury reduction.

STATEMENT OF BERNARD MELEWSKI, ADIRONDACK COUNCIL

Good Morning. My name is Bernard Melewski. I am the Deputy Director and Counsel of the Adirondack Council. I would like to thank the chairman, and the Members of the committee for the opportunity to be here with you this morning and to provide testimony regarding Senate Bill 485-the Clear Skies Act.

The Adirondack Park is the largest park of any kind in the contiguous United States. It is nearly three times the size of Yellowstone National Park and covers one fifth of the State of New York, making it equal in size to the State of Vermont. The Adirondack Park is roughly six-million acres of public and private land containing the largest assemblage of old growth forest east of the Mississippi River. The Adirondacks include the headwaters of five major drainage basins. Lake Champlain and the Hudson, St. Lawrence, Mohawk and Black rivers all draw water from the Adirondack Park. Within the Park are more than 2,800 lakes and ponds, and more than 1,500 miles of rivers fed by an estimated 30,000 miles of brooks and streams. The Park contains 46 mountain peaks more than 4,000 feet in elevation. Forty-five percent of the Park is publicly owned Forest Preserve protected as "Forever Wild" by the New York State Constitution since 1895. One million acres of these public lands are further protected as Wilderness.

The Adirondack Council was founded in 1975. It is a private, not-for-profit organization dedicated to enhancing the natural and human communities of the Adirondack Park through research, education, advocacy and legal action. We receive no Federal or State funding.

Our interest in The Clean Air Act and the problem of acid rain is long held. We helped craft the first acid rain law in the country which was adopted in 1984. The New York law identified both sulfur dioxide and nitrogen oxide as precursors to acid rain, sought limits on total emissions from power plants within the State and even proposed an innovative trading mechanism that Congress adopted nationwide in the Clean Air Act Amendments of 1990.

The Adirondack Council was also an active participant in the national debate that led to the adoption of the acid rain program in Title IV of the Clean Air Act Amendments of 1990. Our publication, "Beside the Stilled Waters," which was produced and distributed in cooperation with our member organizations, brought the problem of acid rain to the attention of the Nation and to Congress. (See Also "Acid Rain and the Adirondacks: A Legislative History." Albany Law Review. Vol 66 Number 1 2002)

The acid rain program, as adopted, was not without controversy. Congress adopted an innovative "cap and trade" program, modeled after the New York legislation, which would abandon the so-called "command and control" approach to regulation, in favor of a free wheeling pollution allowance trading program that would provide utilities with the flexibility to make compliance strategies part of their long-term business planning. The Adirondack Council, among others raised concern that the cap on total emissions might not be low enough to protect sensitive areas. Others debated both the need for and the cost of the program

The Adirondack Council was also one of the most severe critics of the program EPA designed to implement Title IV. We had concerns about the initial allocation of credits, the adequacy of the continuous monitoring systems, and, together with the Natural Resources Defense Council sought changes in Federal court. (Cases consolidated under EPA v. Browner) We are pleased to say that years of good-faith negotiation between the USEPA, the affected industry and the conservation community resulted in very positive changes. Unfortunately, EPA now administers an efficient mechanism that will accomplish a goal that, in hindsight, was too modest.

In 1992, a deputy administrator for the EPA grandly pronounced in a press release that the regulations implementing the new Clean Air Act Amendments would mean "the end to acid rain in the Adirondacks." Certainly that was the intention of the Senate and the House. But wisely, Congress had ordered a series of reports that would advise the members of the success or failure of the goals of the acid rain program.

Sadly the news has nearly all been bad.

Due to its location and its thin soils, the Adirondack Park has suffered the worst environmental damage from acid rain in America. It is the region where the problem was first documented in the United States. Prevailing winds carry power plant emissions from the Ohio Valley into the Adirondack Mountains, where they fall as acid rain, acid snow, acid fog and dry acidic particles. The acidity alters soil chemistry, inhibits plant growth and releases heavy metals that are toxic to plants, animals and fish.

Reports conducted by a host of Federal agencies have shown that more than 500 of the Park's 2800 lakes and ponds have become too acidic to support their native life over the past 40 years. The same is true for 28 percent of the Park's 2,000 miles of navigable rivers. Each spring the percentage of acidic rivers explodes to almost 60 percent over the course of several weeks as the winter's acidic snowpack melts. The Park's high elevation spruce and fir and its spectacular maples, are disappearing at an alarming rate. Similar damage to forests is worsening across the East Coast, as well as the Colorado Rockies and the coastal mountains of California.

Every report issued by the Federal Government in the past 10 years reflects these observations, and worse, predicts continuing damage if more is not done to control power plant emissions. The dire predictions are also reflected in a host of other reports from scientists in the field which we discuss later in this testimony.

In 1998, the Adirondack Council was invited by this committee to testify about Senate 172, the Acid Rain Control Act, proposed legislation then sponsored by the late Senator Patrick Moynihan. We said at that time that any legislation that seeks to address the acid rain problem should, at a minimum contain two provisions. The same holds true today:

- Build on the successful sulfur dioxide cap-and-trade program by creating a third phase of reductions further along the current time line. All of the advantages of the current program can be preserved in a predictable, flexible, and cost-effective manner while reducing sulfur-dioxide emissions by an additional 50 percent or more.
- Create a new year-round cap-and-trade program for nitrogen-oxide emissions from utility smokestacks that mirrors the successful program already in place for sulfur. The role of nitrogen deposition both in high elevation waters and forests and in our coastal estuaries is now much better understood and accepted by the scientific community. This cap and trade program should reduce nitrogen emissions from utilities nationwide by approximately 70 percent or more of 1990 levels, resulting in a substantial and beneficial cut that is also reasonably achievable.

It is our conclusion that the bill before you now, Senate 485, the Clear Skies Act, meets and exceeds those two minimum provisions. The bill embraces the cuts envisioned in the Moynihan–D'Amato–Schumer–Clinton proposals over the past several sessions of Congress and then goes beyond those levels in an additional phase of reductions We believe that adoption of the caps proposed for sulfur dioxide and nitrogen oxide in the Clear Skies Act will set the course for recovery of the Adirondacks, and the many other acid rain ravaged sections of the country.

Just last week, final approval was granted for the State of New York to adopt the toughest acid rain regulations in the country. The New York initiative was announced by Governor Pataki 3 years ago, when I last testified before this subcommittee. Senator Voinovich was presiding that day. The Senator, upon hearing the news of the announcement, said, as I recall, that it was an important step. That New York had to show that it was willing to do what we were asking of the rest of the country. Well Senator, it is done, and we are back. The adoption of the regulations reaffirms once again New York's commitment to this issue, despite the fact that more than 80 percent of our acid deposition problem originates outside our borders. We are doing what we can, but we need your help.

The Pataki rules are modeled to implement the provisions of the Acid Deposition Control Act authored by the late Senator Moynihan in 1997, which was reintroduced in the last session of Congress by Senators Schumer and Clinton. New York will require over the next several years a 50 percent reduction from its power plants of sulfur dioxide emissions and a 70 percent cut in emissions of nitrogen oxides from current levels.

The new rules in New York raise an important issue that should be considered as an amendment to the Clear Skies Act. New York is part of the EPA brokered 22 State SIP Call compact that will reduce nitrogen emissions significantly during the summer ozone season by 2004. Under the new rules, however, New York power plants will be required to implement year-round controls in 2004.

USEPA has established a 22–State utility cap-and-trade program for nitrogen emissions as the preferred response for State compliance with its new ozone program. The EPA SIP call, which is only summer seasonal, will not address in a significant way, the acid rain problem. The acid rain dilemma is the total loading of nitrogen to sensitive areas. For high elevation areas the main concern stems from the buildup of nitrogen in the snow pack and the subsequent "acidic shock" to aquatic systems in the spring of the year. Year-round controls will be necessary to address the nitrogen problem. Furthermore, only nationwide reductions will address the problems outside of the 22–State region covered by EPA's plan.

Congress can level the competitive playing field for the utility industry by enacting national controls which will permit an expanded allowance trading market that will be more efficient and cost effective. The Congressional Budget Office, in its report, Factors Affecting the Relative Success of EPA's Nox Cap-and-trade Program (June 1998), identified similar benefits to providing additional statutory authority in a report on the proposed rules this summer.

The Clear Skies Act as currently drafted does not impose those year-round controls until 2008 for the SIP Call States. The Adirondack Council requests that the committee to take a look at whether the imposition of year-round controls could be advanced for the States in that eastern trading region.

The Adirondack Council would appreciate consideration of two other amendments to the Clear Skies Act today as well. The second amendment has already been considered once by this committee. In a mark-up of then Chairman Jefford's bill last session, Senator Clinton offered up an amendment which was adopted by the committee. The amendment was similar to a provision of Senate 588 of last year, which would ensure that measurements of water chemistry were conducted in acid sensitive areas of the country. If by a date certain the benefits anticipated by the legislation were not occurring in sensitive areas, the Administrator would have the authority to reduce emissions from contributing sources to reduce acid deposition in the affected area to levels where the affected water bodies have the capacity to neutralize acids sufficiently to avoid additional damage.

We have every reason to expect that, with the level of reductions proposed in the Clear Skies Act, that such a provision might never need be invoked. But we prefer a belt and suspenders in this case. Neither our region of the country, nor any other that suffers from acid rain, should need to wait another 12 years to solve this problem. We urge you to consider adding language that allows a limited reopener by the Administrator to protect sensitive resource areas. We appreciate that Senator Jeffords has retained the provision in the reintroduction of his bill this session.

Our third request is that the committee examine whether there can be faster timetables, especially in the out years for the second phases of SOx and NOx reductions. One of the remarkable aspects of the 1990 Amendments was that the industry was able to fully comply with two phases of sulfur dioxide reductions only 5 years apart. New York is requiring our power plants to implement year-round reductions of nitrogen oxides very rapidly. While we concede that our generators had a very public "notice" 3 years prior, the committee should examine whether a more ambitious timetable can be accomplished in the out years. The faster we lower emissions, the quicker we will see recovery.

There are many issues ahead to resolve, including the timing and depth of the reductions in emissions of the target pollutants. We encourage you to adopt the deepest cuts in the faster manner that can be accomplished in negotiations with your colleagues. We are excited by the fact that this bill which you sponsor, Mr. Chairman, and that of Senator Jeffords and the bill anticipated from Senators Carper and Chafee all will solve the acid rain problem. Every year that can be gained and every ton that can be saved will hasten the biological recovery of our parks, our rivers and our coastal estuaries, and will save thousands of lives.

Last spring, President George W. Bush visited the Adirondack Park on Earth Day. He said he was committed to solving our acid rain problem and we believe him. We were pleased to see the President chose the solemn occasion of the State

of the Union message to renew that commitment. The introduction by the leadership of this committee of the Administration's proposal is an important step forward. The Clear Skies Act is a good point at which to begin your deliberations Congress now has the historic opportunity to stop acid rain, smog and haze from harming our environment and our health.

I want to extend at this time, on behalf of the Board of Directors of the Adirondack Council, an invitation to all the members of this committee to visit the Adirondack Park and see what a wonderful resource you will have saved. Perhaps, you will hear the haunting call of the loon in the wilderness and know that you have acted to ensure that future generations will share the experience.

This nation committed itself to the task of ending the destruction of acid rain over a decade ago. We think it is time to finish the job. We urge the earliest consideration of measures to improve Title IV of the Clean Air Act and bring an end to acid rain this year.. Thank you again.

Reports to Congress have shown the need for more cuts in emissions

The first report was due in 1993, from the USEPA (ordered under sec. 404, Title IV appendix B of the 1990 CAAA). Entitled the Acid Deposition Standard Feasibility Study Report to Congress, the report (dated October 1995) was finally released in 1996 under the threat of litigation from the Adirondack Council and the State of New York.

The report concluded that the pollution reductions accompanying the 1990 Clean Air Act Amendments would not be sufficient to allow recovery of certain sensitive ecosystems and that some would continue to get worse. The report was particularly compelling for New Yorkers because it revealed that, despite the reductions expected from the 1990 CAA Amendments, the loss of nearly fifty percent of its lakes and acidification of most streams in the Adirondack Park could be expected.

The second of two reports to Congress, the Report of the National Acid Precipitation Assessment Program, NAPAP Biennial Report to Congress: An Integrated Assessment, was submitted to Congress during the August recess in 1998 (ordered under Sec. 901J of the 1990 CAAA). It was due in 1996 and it too was released under pressure from then Senators Moynihan and D'Amato and the threat of litigation from the State of New York. The NAPAP report confirmed and substantially elaborated upon the findings of the earlier report to Congress submitted in 1996 from the EPA.

We believe that a fair reading of both reports to Congress lead to the same two findings:

First, the mechanism of a national cap in emissions coupled with the pollution allowance trading program has been an outstanding success. Facilities are in compliance with Title IV and on schedule. The administrative and implementation costs of the program are less than projected at the time of adoption. The simple, efficient design of the program, coupled with large automatic penalties for exceedences, and the diligence of EPA Administrators and the regulated community are all factors in this success.

The administrative and implementation costs are far below those associated with traditional regulatory approaches because in many ways the program is self-implementing. Devices known as Continuous Emissions Monitors (CEMS) count each ton of pollution as it is emitted from the smokestack. At the end of each year a utility must have enough credits (either initially allocated or purchased) to cover those emissions. The accounting of allowance holdings and trading is in a data base maintained by EPA. Each pollution credit is tracked with its own serial number.

The compliance costs of the program are proving to be far below those estimated when Title IV was adopted. EPA estimated that the fully implemented program would cost four billion dollars a year, and industry estimates were much higher. A report by the the Massachusetts Institute of Technology found compliance costs of less than one billion dollars per year. Again, the design of the program helped achieve these relatively low compliance costs. Other factors, such as rail transportation improvements that reduced the cost of transporting low-sulfur coal were crucial here as well.

The market for trading allowances is improving as well. Each year there are more "economically significant" trades occurring and the value of each allowance is rising steadily. In fact, the Adirondack Council is a market participant. We have acquired thousands of pollution allowance credits, most of them donated as a community good-will gesture by utilities in New York. Unlike most other holders of allowances, it is our intention to retire all credits we may obtain by transferring them to a retirement account we maintain with USEPA. Thousands of individuals around the Nation, have "Clean Air Certificates" on their home or office walls, assuring them

that the Adirondack Council has permanently retired, in their name, one-ton of sulfur dioxide emissions.

There is a real need for emission reductions beyond those called for in the 1990 Amendments. Projections (by EPA and ICF Resources) of what new SO_2 and Nox reductions would cost indicate that deep new reductions could be achieved at or near the initial four billion dollar estimate made by the House and Senate in 1990.

The second major finding of both reports to Congress was that despite the success of the regulatory scheme, the overall cap in emissions is too high to accomplish one of the primary goals of Congress, which was to protect sensitive resource areas from the harmful effects of acid rain.

The NAPAP report also confirmed that acid rain is not just an Adirondack problem.

Ecological damage is significant and widespread

The damage that sulfur and nitrogen pollution causes is far from a regional issue. It is an issue of national importance. Excess nitrogen in waters and in soils—"nitrogen saturation"—can be found in the North East and in West Virginia's Allegheny Mountains, Tennessee's Great Smoky Mountains, Colorado's Front Range of the Rockies and even as far west as the San Bernardino and San Gabriel Mountains. High levels of nitrogen deposition are causing nitrate to leach in stream water from these watersheds. This nitrate leaching acidifies streams and strips base cations from soils. In snow covered areas, the flush of nitric acid stored in the snowpack is the leading cause of "acid pulses" or "spring shock", which is responsible for fish kills during spring thaws.

NAPAP found that high elevation areas in the Northeast and the Appalachians are bathed in acidic cloud water for extended periods of time. Sulfuric acid from sulfur dioxide emissions is the significant cause of the widespread loss of red spruce trees in these areas. The reason for the die back is the leaching of calcium from the spruce needles and aluminum from the soils by the acidic fog which makes the trees susceptible to frost and winter injury.

The coastal estuaries of the entire east coast suffer from airborne inputs of nitrogen that can make up nearly 40 percent of the total nitrogen loaded into their systems. In estuary systems such as the Long Island Sound, Narragansett Bay, the Chesapeake Bay and Tampa Bay in Florida, nitrogen-based pollution is overloading the water with nutrients. This causes "eutrophication," an overabundance of algae. When algae dies and decays, it depletes the water of precious oxygen needed by all aquatic animals. This condition is known as hypoxia. Algae blooms are also associated with fin fish kills, shellfish kills and human illness.

NAPAP also concluded that areas of the United States that are not seeing damage now are likely to in the future, due to an effect known as soil acidification. Over the long term, acidic deposition is slowly leaching away key soil nutrients, like calcium and magnesium (known as base cations) that are essential for plant growth. This nutrient depletion is occurring in high-and mid-elevation forests in New England, New York and the Southern Appalachians. NAPAP cited studies which concluded that fifty-nine percent of the commercial pine forest soil in all of the South East has low enough reserves of these chemicals to warrant concern.

Acid deposition, whether from sulfur-or from nitrogen-based pollution, not only leads to base depletion, but also results in the release of toxic compounds from soils to living things. For example, the release of aluminum from soils rapidly accelerates when pH drops below 5. The release of aluminum interferes with plant biochemistry. It is also the leading cause of fish mortality in affected lakes. In other words, it is not only the acidity directly, but also the aluminum toxicity that is responsible for the damage. This effect is very widespread. NAPAP cited studies, conducted in the Shenandoah National Park, show that fish species richness, population density, condition, age distribution, size and survival rate were all reduced in streams no longer able to neutralize acidity. Another NAPAP study of streams in the Adirondacks, Catskills and Northern Appalachians in Pennsylvania showed that episodic acidification "acid pulses" had long term adverse effects on fish populations including significant fish mortality.

Lake acidification, whether from sulfur or nitrogen is also clearly implicated in the increase in mercury concentrations found in fish. Acidity leads to greater conversion of mercury from its less toxic elemental form to methyl mercury, which is much more toxic. Fish consumption warnings due to mercury contamination are common in many states and are on the rise. The bio-accumulation of mercury in some species of fish in New York has reached levels that threaten our loon population, which are dependent on the fish as a primary food source. In dozens of lakes in the western mountains of the Adirondack Park and in the Catskill Mountain reservoirs of New York City's water supply, the levels of mercury in some fish species exceed that

which is safe for human consumption, and children and women of child-bearing age are urged to avoid perch and bass altogether. The acid rain problem is now a public health problem.

The cost to Americans from acid rain is not just the loss of pristine lakes in one of its greatest parks, or the almost imperceptible die out of sensitive species of trees, or even the haze obscures the views of four national parks, it is also in the loss of our great monuments, our collective tribute to our ideals and to those who have come before us.

The Capitol building is crumbling. The corrosive effects of acid rain are eating away at its marble and that of many of the great monuments on the mall. The Lincoln memorial corrodes more every year. So it is with buildings and monuments throughout the Capitol, so numerous and so obvious that until recently you could purchase an illustrated guide to the acid rain damage to our nations capitol, thoughtfully provided free of charge to the public by the U.S. Park Service. (Acid Rain and our Nation's Capital, U.S. Dept. of the Interior/U.S. Geological Survey, 1997)

The monuments to the fallen on the great battle sites of the Civil War, Gettysburg and Vicksburg, are dissolving from the acid bath they endure each rainy day. The Statute of Liberty stands melting on its solitary island.

This is why the fight to stop acid rain has been joined by many of the nation's prestigious organizations dedicated to historic preservation, such as the National Trust For Historic Preservation and the "Save Our Sculpture" Project of the Smithsonian.

All of this disturbing information was been exhaustively peer reviewed and verified by the May 1998 National Acid Precipitation Assessment Program Biennial Report to Congress.

Other studies have found similar results.

Environment Canada, in its 1997 report "Toward a National Acid Rain Strategy", said that reducing sulfur emissions significantly beyond the current Clean Air Act requirements in both countries would be needed for all of eastern Canada to be protected from acid rain. In southern Canada, an area the size of France and Britain combined continues to receive harmful levels of acid deposition. As many as 95,000 lakes in the region will remain damaged.

A study released by Trout Unlimited in 1998, that was conducted by the University of Virginia found that without deep additional deposition reductions up to 35 percent of Virginia trout streams would become "chronically acidic" and would no longer support trout populations. The study further estimated that thousands of trout stream miles in the Southern Appalachians may be lost to acidification.

While we hold no special expertise in the field of the health effects of air pollution, a brief review of the literature reveals some interesting facts. EPA's 1995 study, Human Health Benefits from Sulfate Reductions Under Title IV, estimates that every dollar spent reducing SO_2 emissions could generate ten dollars in savings from reduced health care costs. Considering the steep rise in asthma cases, acting to reduce air pollutants now is an important health initiative.

In 1999, Nature, perhaps the most respected journal of its kind, published the broadest geographical study of acid rain to date. Written by 23 scientists, all of them top acid rain researchers, and taking samples from roughly 200 sites, the study again confirmed and elaborated on the disturbing findings of earlier works.

Unfortunately, the next scheduled report by NAPAP to Congress is again 2 years overdue. It is easy to predict that its findings will only stimulate more demand for action by Congress on acid rain. Several studies released since that time only reinforce the desirability of moving ahead.

In May of 2000, the Ecological Society of America released it workshop report from its 1999 conference of 50 of North America's top research scientists. The report States that parts of New Hampshire, Maine and California were suffering lake acidification and forest death as severe as those observed in New York's most sensitive areas. Major findings of the report included:

- More cuts are needed in sulfur dioxide and nitrogen oxides to protect sensitive areas of the country from environmental damage;
- The White Mountains of New Hampshire and the lake country of Maine were showing little or no recovery;
- Nitrogen oxides can be equal in destructive power to sulfur dioxides;
- Nitrogen saturation, already begun in the Adirondacks, is actually worse in the San Gabriel and San Bernardino Mountains of southern California, which had the highest concentrations of nitrogen in North America;
- Acid shock is more widespread than previously believed; and
- It is very important to continue the long-term research into the effects of acid rain, including studies of cloud water, dust particles, rain, sleet and snow.

At the beginning of the last session of Congress, the Hubbard Brook Research Foundation released a new summary report, Acid Rain Revisited of its findings of the scientific advances since the 1990 Clean Air Act Amendments. The report's main conclusions are that our soil problems are getting worse and the forests are dying faster than we thought. The Hubbard Brook study is one more brick in a huge wall of evidence that acid rain must be stopped as soon as possible.

Briefly stated, the findings include:

- Acid rain is still a problem and has a greater environmental impact that previously projected;
- Acid deposition has altered soils and stressed trees in areas of the Northeast and has impaired lakes and streams;
- The Clean Air Act has had positive effects, but emissions and deposition remain high compared to background conditions; and
- The rate and extent of ecosystem recovery from acid deposition are directly related to the timing and degree of emission reductions.

And in January of 2003, the US Environmental Protection Agency's Office of Research Development issued a report showing that the cuts in air pollution since 1990 have produced corresponding modest-but—encouraging improvements in concentrations in lake water across the Northeast, including the regions's hardest-hit area, the Adirondack Park. The good news from that report is that we have been taking the right approach by reducing sulfur dioxide and nitrogen oxide emissions from power plants. We are targeting the right sources and the right pollutants. Our natural ecosystems are beginning to show signs of chemical recovery, but is a long road from the start of chemical recovery to full biological recovery-the point where you see the fish, trees, and other native species coming back in healthy numbers. We need to continue down this road and act this year to make significant new cuts that will not only turn the corner but also accelerate the natural healing process.

The call for additional action on acid rain is not just a New York plea.

The problems these pollutants bring are felt from Maine to Florida and beyond. The actions we call for will improve the environment and public health to the benefit of virtually every American.

In May 1998, the Conference of New England Governors and Eastern Canadian Premiers recommended additional reductions in utility emissions of SO_2 and NOx, similar to the provisions of the Moynihan legislation.

In August of 2002, the unanimous report of the Southern Appalachian Mountains Initiative, released by representatives of eight southern States (North Carolina, South Carolina, Kentucky, Virginia, West Virginia, Tennessee, Georgia and Alabama), concluded that its mission cannot be accomplished without emissions reductions in States outside the region. The final report also States that "The SAMI States support and will promote national multi-pollutant legislation for electric utility plants to assure significant sulfur dioxide and nitrogen oxide reductions, both inside and outside the SAMI region. This national multi-pollutant legislation should result in no less than the reductions for sulfur dioxide and nitrogen oxides represented by the Administration's Clear Skies Initiative". We concur. congressional action is the best solution

The sad alternative of more delay is continued destruction of the nations most pristine resources and treasured monuments. The failure to act now will also heighten the desire to find alternative, and more confrontational, routes to stop acid rain.

The disturbing and overwhelming evidence of the destruction of the streams, lakes and forests on public lands, protected by New York's State Constitution as "Forever Wild" and the pollution of our coastal estuaries has raised grave concern in New York. Absent clear movement by Congress to adjust the sulfur program and deal with the companion problem of nitrogen as long-range transport of pollutants, there have already been numerous efforts in New York to mitigate the problem through any other avenue available. In the past several years, the Office of the Attorney General of the State of New York has sought legal redress via other provisions of the Clean Air Act. Most recently, Attorney General Eliot Spitzer has brought suit against 17 utilities in five States, using the long arm of the Clean Air Act to force change.

In 2000, New York's State Senate passed unanimously a bill that is intended to discourage the trade or sale of excess pollution allowances that our own utilities may own for the eventual use in 12 upwind States. I assure you, the New York State Senate is not known for its hostility to business or to the free market. The State Senate action, we believe, reflects a consensus that something must be done. The State Assembly did adopt the same measure, which was signed into law that year. Not surprisingly, a coalition of utilities challenged the measure on constitu-

tional grounds, winning at the Federal district court level. The lower court decision is currently under appeal by the State, where an opinion is pending. (See Clean Air Markets Group, 194 F.Supp. 2d.147 NDNY 2002)

We believe that the greater the delay in action by Congress to repair the flaw in the acid rain program, the more likely that you will see actions like those just mentioned in New York taken in other affected States. The better alternative is to fulfill the original intent of Congress to solve the acid rain problem by taking action soon.

RESPONSES OF BERNARD MELEWSKI TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. The Hubbard Brook Research Foundation, the preeminent institution for the study of acid rain, has said that cuts in sulfur dioxide of at least 80 percent beyond phase II (that's down to about 1.8 million tons) will be necessary if we are to see biological recovery in the lakes and streams of the Adirondacks by mid-century. You probably know that Clear Skies stays above that level, at the 3 million ton level, until at least 2061. Is that acceptable to your members?

Response. Our members are interested in stopping the damage from acid rain as soon as possible. We would prefer an elimination of all power plant emissions upwind of the Adirondacks. Reductions of an additional fifty percent in emissions of acid rain precursors from power plants, which is the minimum that needs to be done, has been proposed in Congress virtually every year since the passage of the 1990 Clean Air Act Amendments without success.

The Hubbard Brook Foundation report is not a revelation to scientists in the field, but is a logical outcome. The faster we cut emissions and the deeper the cuts the more rapid the chemical change and then biological recovery. Thus an 80 percent reduction promotes full recovery at a faster rate than a 50 percent reduction.

Recent studies published by the USEPA and others provide scientific certainty that Congress targeted the correct pollutants from the appropriate sources in enacting Title Four of the Clean Air Act Amendments of 1990. Signs of chemical recovery are there in the waters of the Adirondacks ans elsewhere. But more must be done and soon.

But every year of delay means more damage to sensitive areas like the Adirondack Park. That is why our testimony puts emphasis on the need to reach agreement on the fastest timetable with the deepest cuts that can move out of Committee and pass the Senate this year.

Question 2. EPA's climate assessment work indicates that virtually all brook and brown trout habitat, as well as fifty to seventy percent of maple forests, could be lost throughout New York due to global warming. And, as a result, the character of heavily visited areas like the Adirondacks may change. Do you believe that there is a significant risk of substantial ecological and economic harm facing the Adirondacks due to global warming?

Response. The Adirondack Council, in the fall of 2002, held a major conference entitled AClimate Change and the Future of the Adirondacks.@ The conference reaffirmed that climate change is real and could eventually have profound impacts on the natural resources, weather patterns and tourism industry within the Adirondack Park.

As we testified, the Adirondack Council is supportive of the addition of provisions on climate change in any bill that the Committee and the full Senate may choose to advance. There are a number of proposals from mandatory controls to phased decreases in carbon dioxide emissions that provide an opportunity for compromise. We do not support, however, further inaction on sulfur and nitrogen emissions from power plants due to disagreement in the Senate over the appropriate provisions on climate change. We need action on acid rain as soon as possible.

It is also important to acknowledge that stopping acid rain is an integral part of any climate change strategy. Recent studies from NAPAP to the Hubbard Brook Foundation acknowledge that acid deposition is disrupting the life cycle of our forests. From Maine to Georgia, our forests are in poor health due to the complex and damaging impact of acid deposition. Healthy forests are critical to carbon sequestration and to moderate the affects of global warming by cooling the landscape. The Adirondack Park, with its AForever Wild@ Constitution protection, may be a model for future climate change programs.

Restoring the vitality of our forests should be a critical element of any climate change strategy, and that means bringing and end to acid deposition as rapidly as possible.

RESPONSE OF BERNARD MELEWSKI TO AN ADDITIONAL QUESTION FROM SENATOR VOINOVICH

Question. In your testimony, you mentioned that adoption of the caps proposed for sulfur dioxide and nitrogen oxide in the Clear Skies Act will set the course for recovery of the Adirondacks, and the many other acid rain ravaged sections of the country.

Critics of Clear Skies claim that the bill will actually roll back the Clean Air Act.

Would the recovery you talk about in your testimony be faster under current Clean Air Act provisions?

Response. The existing provisions of the Clean Air Act are not adequate to solve the acid rain problem. First, it is an unreliable assumption that the law will be expeditiously executed. The historic reality of Clean Air Act implementation has been erratic enforcement, prolonged litigation and fits and starts in implementation. This pattern has endured over a number of Democratic and Republican Administrations. Notably, there has been one exception and that has been the implementation of the cap and trade market-based provisions of Title Four of the Clean Air Act Amendments of 1990, the Acid Rain Provisions. The Clear Skies Act, S. 485 , and other major proposals before the Committee seek to capitalize on the success of that program which to date has met or exceeded all deadlines with virtual 100 percent compliance by the affected industry, at significantly below projected cost.

While the mechanism has been shown to be worth emulating, the caps on emissions established in 1990 were too high to achieve the fundamental goal of the program: to stop the damage to sensitive resources from acid rain. This gap between goal and performance has been documented in several Reports to Congress since 1990. The Act must be amended to lower the emission caps on sulfur and to establish a new cap-and-trade program on nitrogen year-round. A similar cap-and-trade approach was recently proposed for carbon dioxide emissions for the northeast by New York Governor George Pataki.

Recent efforts to discredit the Clear Skies Act have compared projected outcomes from full implementation of the existing Act, with the projected levels of sulfur dioxide and nitrogen emissions predicted for the Clear Skies proposal. If one extends the comparison to other bills sponsored in the Committee, one readily finds that none of the major proposals are as effective in both nitrogen and sulfur reductions as the predicted outcome of faithful implementation on of the Clean Air Act. Either one presumes that nobody knows what they doing on Capitol Hill or one has to conclude, as we do, that hypothetical scenarios should not be the basis for establishing national policy.

CLEAR SKIES ACT OF 2003

THURSDAY, MAY 8, 2003

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON CLEAN AIR, CLIMATE CHANGE AND NUCLEAR SAFETY,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:35 a.m. in room 406, Dirksen Office Building, Hon. George Voinovich [chairman of the subcommittee] presiding.

Present: Senators Voinovich, Carper, Jeffords [ex officio] and Inhofe [ex officio].

OPENING STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE STATE OF OKLAHOMA

Senator INHOFE. The hearing will come to order.

We have an awkward situation this morning that I will explain to you. That is we have a vote beginning in about 5 minutes. I have a conflict with the Senate Armed Services Committee where we are currently marking up that bill, so I will go ahead with an opening statement. By the time I am through, I believe the members will be coming in. If not, we will recess until they come in and I won't be able to stay. Let me than you for coming, Mr. McSlarrow. It is always a pleasure working with you in many, many capacities and this is another.

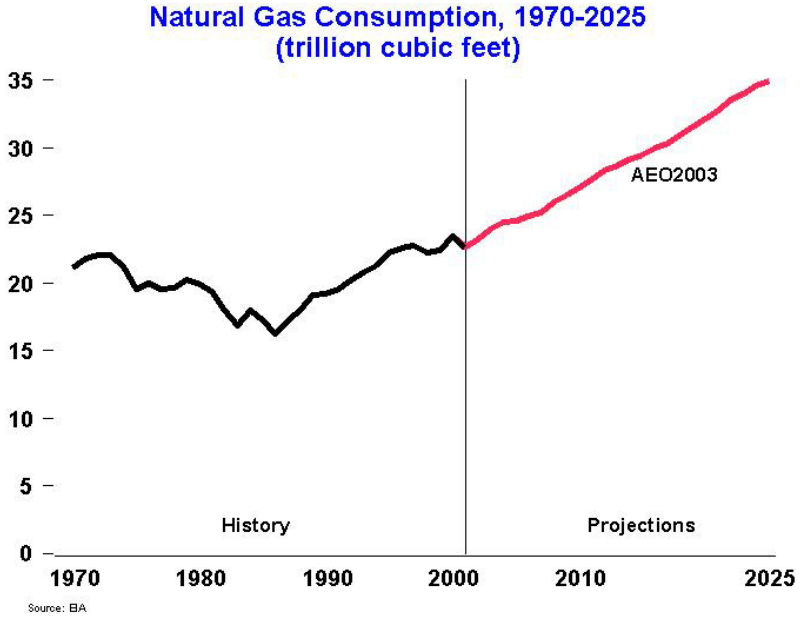
I also want to extend my appreciation to Richard Metz who made the trip here today from Oklahoma to explain the pressures facing the natural gas industry.

This hearing will help us understand the relationship of clean air requirements to natural gas supplies, price levels and price volatility. Natural gas is a vital fuel source in meeting our Nation's energy requirements. Natural gas heats homes, creates electricity for power, plants and industrial users, and is used as a feedstock in the production of many goods and services.

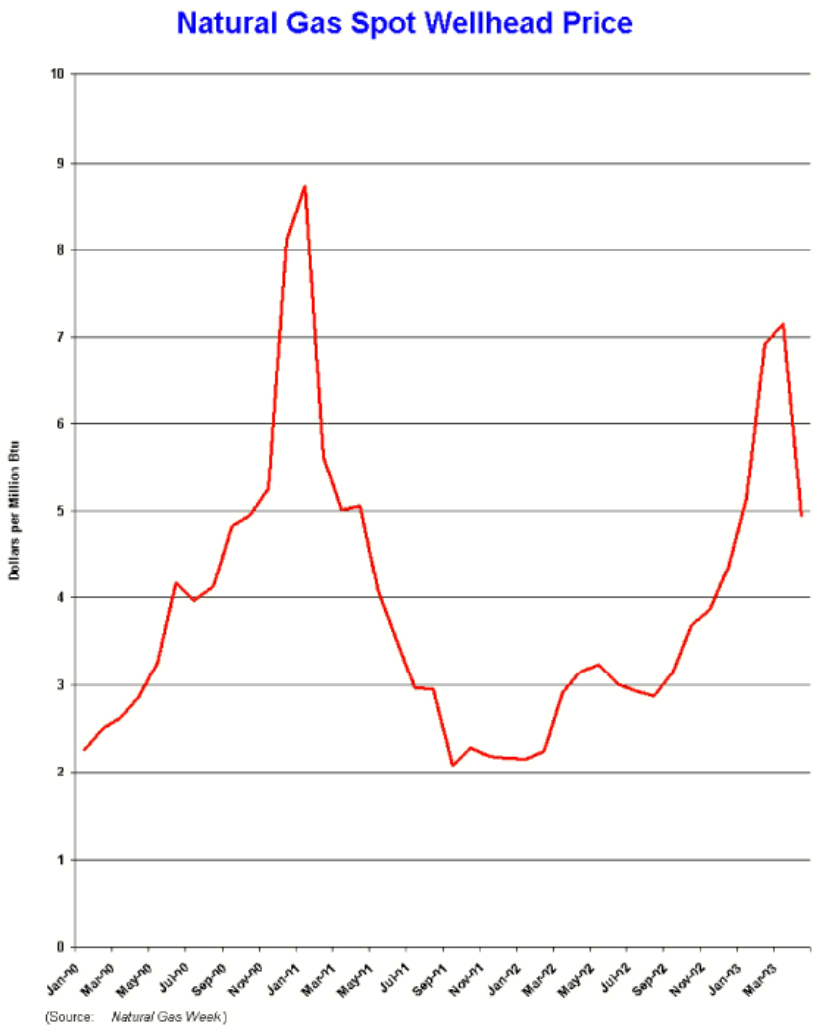
In 2002, these sectors consumed almost 22 trillion cubic feet of natural gas. Powerplants generating electricity for the grid consumer consume about one fourth that amount, as does the residential market. The remaining half is largely consumed by commercial and industrial users.

I am committed to maintaining a diverse fuel mix in the generation of our Nation's electricity. Natural gas is an important an integral fuel in maintaining that diversity. Unfortunately, over the last decade due to clean air requirements, virtually all powerplants coming on-line has been gas-fired. One of the strengths of natural

gas historically was that it provided needed supplies at fairly stable and reasonable prices. I am concerned this strength has been eroded by the over-reliance on gas to meet our electricity needs. The effects are already becoming clear. While natural gas prices were fairly stable through the 1990's, the prices have become more volatile in recent years. As this chart shows, in 2000 and early 2001, average monthly natural gas wellhead spot prices climbed from about $2 to $9, then settled down to $2 at the end of that year. Earlier this year, average prices climbed to more than $7 with prices spiking at $19 on February 25.



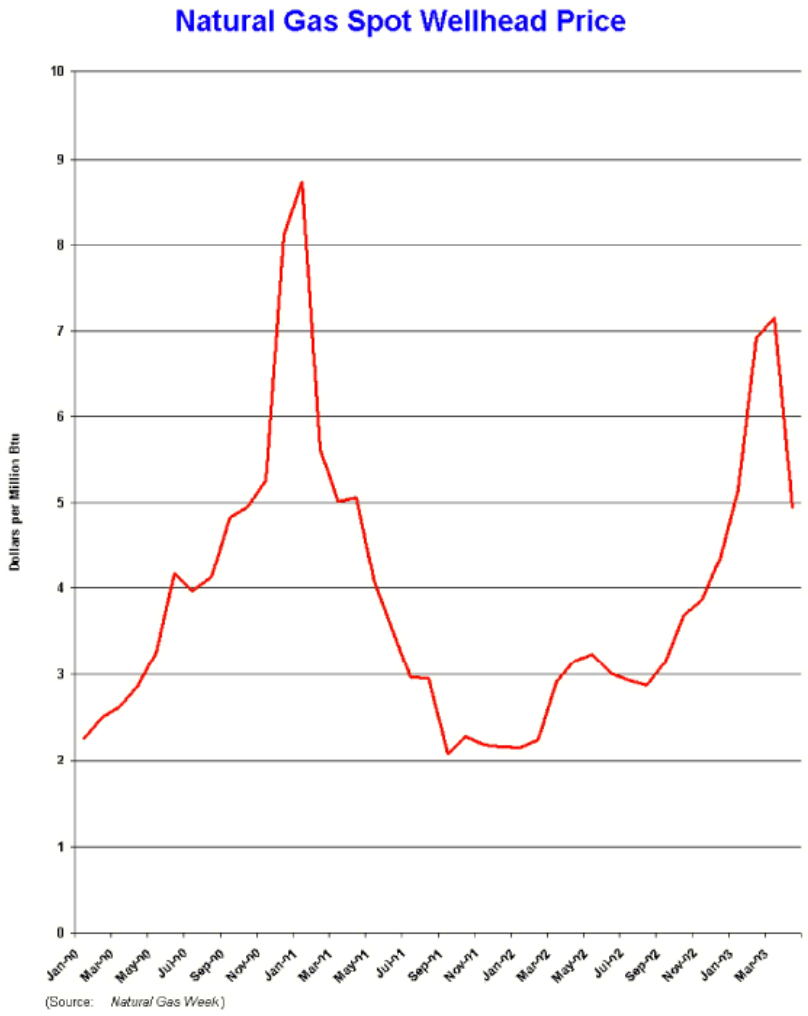
As this next chart shows, gas prices are not only becoming more volatile, but are projected to increase in real terms. As you can see, according to Energy Administration reports, the 2003 projected prices through 2005 are higher for the same period than had been forecast for just the year before. Even 2003 projections now look overly optimistic given current prices of $6.



Of course these price swings and hikes do not occur in a vacuum. Part of this is due to limits on production and restrictions on constructing pipelines which are issues I believe need to be resolved to help the industry continue to supply this critical fuel source.

At the same time as gas production is facing increased challenges, demand has increased and that demand is projected to increase more in the future as this chart shows. This spike in demand has had adverse impacts on small businesses, many fertilizer manufacturers and plants have gone out of business as a result of the price spikes over the last few years. Many manufacturers use natural gas not only to power their facilities but in the production process itself. U.S. chemical producers are now the world's highest

cost producers because they are dependent upon natural gas prices and prices are higher here than elsewhere in the world.



I remain concerned that with the large amount of investment needed by coal plants to comply with significant emissions reductions contemplated under Clear Skies, fuel switching could become even worse despite the rising prices. As I have said before, one of my top priorities is to ensure that quality science drives policy and not the other way around. We have had some bad experiences in the past where policies were derived and concluded and then they come up with the science to justify the policy positions.

It is imperative that this committee be sure the modeling assumptions used to justify the bill related to fuel switching, natural gas markets, and control technologies are accurate and objective. In

future hearings on Clear Skies, I hope the Administration will provide us with the necessary data to make these evaluations.

I have testimony from the Aluminum Association and Fertilizer Institute and will submit them for the record. Without objection, it will be submitted.

With that, we have a vote in progress and I believe probably the members of the committee are going to vote and then come here. I appreciate the indulgence of the audience, of you Mr. McSlarrow and you Mr. Metz for having to proceed in this manner. Thank you very much.

We are now in recess subject to the call of the chair.

[Recess.]

OPENING STATEMENT OF HON. GEORGE V. VOINOVICH, U.S. SENATOR FROM THE STATE OF OHIO

Senator VOINOVICH. The hearing will come out of recess.

I understand from talking to the chairman of the committee that he began the hearing this morning and shared his opening statements with you.

I would like you to know this is the second hearing we have had on the Clear Skies Act, S. 485 and continues the discussion we in this committee have had for several years on the complex issue of how to clear our air by reducing emissions without putting our economy in a stranglehold.

Today's hearing will focus on the issues surrounding our use of natural gas to generate electricity. There is perhaps no greater illustration of our need to harmonize our environmental and energy policies than the effects of fuel switching from coal-based generation of electricity to natural gas-based generation on our economy. Americans consumed 22.6 trillion cubic feet of natural gas in 2001; currently we consume approximately 25 trillion cubic feet annually and are projected to consume 37.5 trillion cubic feet in 2025. Natural gas is used to heat homes, generate electricity and in the commercial, industrial and transportation sectors.

Historically, the industrial sector has been the largest natural gas consuming sector, consuming 7.5 trillion cubic feet in 2001, followed by residential use for home heating, water heating and cooking and natural gas consumption in the industrial and residential sectors is roughly about what it was in the 1980's. Natural gas for electricity generation, however, has risen considerably during the last two decades to 5.3 trillion cubic feet in 2001 and is projected to grow even more dramatically over the next 2 years. EIA projects that 30 percent of the electricity generated in 2025 will be natural gas-based, a significant increase over the 17 percent of our electricity that was generated by natural gas in 2001 and 2002.

Reliance on natural gas for even this much generation has put a tremendous strain on natural gas supplies and pushed prices on available gas to record high prices. The President's National Energy Policy Task Force projected that over 1,300 new powerplants will be needed to be built to satisfy America's energy needs over the next 20 years. Because of the emissions limits and regulatory uncertainty triggered by the Clean Air Act, the Department of Energy currently predicts that over 90 percent of these new plants will be powered by natural gas.

Just this week, I was told by the CEO of a major utility in Ohio that does business not only in Ohio but in the Midwest, that due to regulatory uncertainty, surrounding coal-based generation that confronts him, the only option he has when building new capacity is to switch to natural gas because of where we are today in terms of the uncertainty of the future.

We do not have enough natural gas to power all these new facilities and we do not have the capability to increase our supply to meet this demand. We do, however, have major domestic reserves of natural gas in the Rockies, off the East Coast, off the West Coast and in the Gulf of New Mexico that are off limits for development. We have tremendous reserves of natural gas in Alaska without the ability to pipe it down to the lower 48. Perhaps most disturbing, we have seen a 5.6 percent decline in natural gas supplies in the continental United States in 2002 and a 2.3 percent decline in domestic natural gas production in 2002.

Unless Congress develops a plan to deal with the situation, we are looking at major natural gas shortages and enormous increases in natural gas prices which will inevitably lead to higher electricity prices. Shortages of the natural gas supply result in increase in natural gas prices and do not just affect utilities. This is very important. Many other industries rely on natural gas such as the agriculture community, the steel and metal industries, the plastic manufacturing industry which is being devastated in Ohio because of the high cost of natural gas, polymer manufacturers and the food processing industry.

A major shortage of natural gas coupled with skyrocketing energy prices will ensure that many of our companies will no longer be able to remain competitive in the global marketplace. Today we will hear from Jim Krimmel, the President of Zaclon Chemical, Inc., an Ohio-based chemical manufacturer with worldwide sales who will discuss the enormous burdens that increased energy costs have placed on his business and threatened the very existence of his company.

Although high natural gas prices have severely affected businesses and their ability to compete in the global marketplace, they have an even more profound impact on low income families and the elderly. Each year, many Americans are forced to make choices between paying to heat their homes, for food or other essentials such as medicine and energy prices are very, very high.

In order to diffuse the time bomb of skyrocketing natural gas and electricity prices that is sitting in our lap, Congress must enact a comprehensive energy policy that will increase our development of natural gas supplies and ensure that we have a diverse fuel mix for electricity generation that includes nuclear renewables, natural gas and coal. To get there, the Senate must pass both comprehensive energy legislation that promotes domestic natural gas development and multi-pollutant legislation that will streamline the regulatory process, maintain the diversity of our fuel mix and achieve greater emissions cuts to protect our environment.

I am pleased to note that our distinguished Majority Leader, Senator Frist, has brought the Energy bill to the Senate floor this week in order to address our Nation's need for a comprehensive energy policy. It is no coincidence that we are considering both energy

legislation and environmental legislation at the same time as they really are two sides of the same coin. Any worthwhile energy policy must take into account protection of the environment and at the same time any worthwhile environmental policy must take into account protection of our economy.

The Clear Skies Act, S. 485, I believe is an example of environmental legislation that will protect our economy, will improve the Clean Air Act by providing greater certainty that emissions are reduced while providing a stable, regulatory environment that allows utilities to install necessary pollution controls without the fear that those controls will be obsolete before they are paid for. It will result in cleaner air, less regulation, and litigation. It will lower energy costs to manufacturers and American consumers. Simply put, this legislation will provide tremendous benefits to the environment and is crucial to the long term survival of our economy and our manufacturing base.

I want all of you to note here that manufacturing in this country is really under pressure today. It is more vulnerable today and more at risk than at any time in my career in government.

The flexibility of the Clear Skies market base cap and trade program and the certainty of emissions reduction targets will ensure that the real emissions reductions called for in this bill can be achieved without forcing utilities to fuel switch and without forcing electricity and natural gas prices through the roof. Perhaps more importantly, Clear Skies will help ensure that the least of our brothers and sisters will not be forced to forego heating their homes and that our companies will not be forced to move overseas to remain competitive in the global marketplace due to high cost of electricity and natural gas.

As I mentioned at the beginning of my remarks, this is the second hearing we are holding in this subcommittee on Clear Skies. It is my intention to hold a third hearing on this legislation in the near future that will focus on emissions reduction technology and issues surrounding the financial stability of the utilities that are required to install such equipment in order to complete with the Clean Air Act requirements.

I also intend to mark up Clear Skies at the subcommittee level following the Memorial Day recess and I want to restate my firm commitment to push hard to have the full committee report to the floor and have the Senate pass this bill in this Congress.

I want to thank our first witness this morning, Deputy Secretary McSlarrow for coming to present the Administration's take on natural gas supply and pricing issues to the subcommittee. I look forward also to the testimony of our other witnesses and to working with members of the subcommittee as we move forward on legislation to address these critical issues.

Senator Jeffords, the ranking member of the committee, has joined us. Senator Jeffords?

OPENING STATEMENT OF HON. JAMES M. JEFFORDS, U.S. SENATOR FROM THE STATE OF VERMONT

Senator JEFFORDS. Thank you.

It is always important that the committee collect information on the effects of legislation on various sectors of the economy, includ-

ing energy, industry and natural gas. Of course, however, the committee's first and foremost responsibility is to be sure the Nation's laws are protective of public health and the environment. It is our job to set performance standards for industry that are adequately productive and wherever possible, fuel neutral. These standards should not be skewed to protect any one industry but should encourage sustainable, economic development.

The Clear Skies proposal does not fit that criteria. As one analyst said, "It is the best case scenario for coal." The proposal was designed to protect 40 or 50 year old coal-burning plants from any risk of having to meet modern environmental standards or needs. That is hardly fuel neutral and so it does nothing to stimulate the development of technology to burn coal more cleanly and efficiently.

I have grave concerns that Clear Skies will do a much worse job than the current Clean Air Act when fully and faithfully implemented. Clear Skies caps are too weak, the deadlines are too late, and the State authorities are to degraded. Because of these flaws, the bill will delay the attainment in many areas forcing millions of people to breathe unhealthy air longer than the current Air Act allows. That is the outcome that I am not willing to accept.

As I have noted in previous hearings, quality and timely information is crucial if we are going to work out a compromise on multipollutant legislation that can be supported by this committee. Unfortunately, such information has been hard to come by from this Administration. I am starting to believe that this is because they are not interested in compromise.

Governor Whitman promised me in February that the information flow would improve but I am still waiting on answers to questions from March. Perhaps Mr. McSlarrow can explain today why the Department of Energy has completely failed to provide an NSR document log that it promised on September 25, 2002 would be delivered to the committee on October 24, 2002. In addition, at some point very soon, the Administration will have to explain why they are not allowing EPA to run emissions and economic modeling for the Federal Advisory Committee working on the Utility MACT Rule.

Without objection, I would like to place in the record NESCAUM's effort to analyze what EPA won't.

Senator VOINOVICH. Without objection.

[The information referred to follows:]

MERCURY MACT UNDER THE CLEAN AIR ACT: AN ASSESSMENT OF THE MERCURY EMISSIONS OUTCOMES OF STAKEHOLDER GROUP RECOMMENDATIONS

NESCAUM—MAY 8, 2003

1.0 Background

Mercury is a persistent, bioaccumulative, neurotoxic pollutant. When released into the environment and deposited or carried into water bodies, mercury is easily converted to methylmercury, a particularly toxic mercury compound, and accumulates in sediments. Methylmercury is readily transmitted up the food chain and accumulates in the tissues of animals. Exposure to mercury can cause numerous adverse effects in plants, birds, and mammals, including humans.

In humans, methylmercury is transported across the placenta into the brain of the developing fetus. In young children and fetuses, methylmercury inhibits the normal development of the nervous system, an effect that may occur even at low exposure levels. This damage frequently is not apparent until later in the developmental process, when motor and verbal skills are found to be delayed or abnormal. Develop-

mental effects have been found in children exposed in utero, even though their mothers did not experience any symptoms of adult toxicity. States are sufficiently concerned about the public health impacts of mercury exposure that most have posted advisory warnings about fish consumption—the primary exposure route in humans.

In 1998, the U.S. Environmental Protection Agency (EPA) identified mercury as the hazardous air pollutant of "greatest potential concern" associated with coal-fired electricity production.[1] Moreover, coal-fired power plants were identified as the largest remaining source of airborne mercury emissions in the U.S. following the regulation of other important mercury sources, such as municipal and medical waste incinerators, in the late 1990's. Under a legal settlement reached pursuant to the Clean Air Act Amendments of 1990, EPA is required to promulgate mercury emissions standards for electricity generating utility boilers by December 2004. These standards—which according to the explicit language of the Clean Air Act must reflect the utilization of "Maximum Achievable Control Technology" for mercury—are expected to be implemented by December 2007.

To assist in the development of Maximum Achievable Control Technology (MACT) standards for power plant mercury emissions, EPA convened a multi-stakeholder group known as the Utility MACT Working Group (hereafter, Working Group). The Northeast States for Coordinated Air Use Management (NESCAUM) has participated in this group since its inception. NESCAUM is an interstate association of air quality control agencies in the eight Northeast States (the six New England States, New York, and New Jersey). Together with other Working Group participants, NESCAUM worked to develop a set of specific recommendations to EPA concerning issues related to the setting of MACT standards for mercury emissions, consistent with the requirements of the Clean Air Act.

Ultimately, the stakeholder groups participating in the Working Group could not agree on a single set of recommendations for mercury emissions standards. Instead, the Working Group's deliberations resulted in separate recommendations from a range of stakeholders, including distinct recommendations from four major stakeholder groups: the State and Local Agency Stakeholders,[2] the Environmental Stakeholders,[3] the Clean Energy Group (CEG),[4] and multi-industry stakeholders under the name "Majority Industry Group."[5] The first three of these groups reached significant consensus, however, jointly signing a memorandum to the members of the Clean Air Act Advisory Committee indicating that there were, in fact, broad areas of agreement among them.[6] This memorandum also expressed concern that the final report of the Working Group had obscured the extent to which consensus had been achieved among many of the stakeholders on important issues.

Throughout the Working Group's deliberations, EPA represented its intention to model the impact of stakeholder group recommendations on mercury emissions from the electric power sector using ICF's IPM model. Recently, however, EPA indicated that it will delay—and perhaps forego entirely—any IPM analysis of stakeholder recommendations. In light of this decision, NESCAUM decided to analyze the emissions impacts of the recommendations of these four stakeholder groups participating in the Working Group.

Each of the stakeholder groups submitted recommendations for mercury reductions in terms of a specific rate-based emission standard or an alternative approach allowing sources to meet either a specific rate-based emission standard or a specific percentage reduction requirement. NESCAUM undertook this analysis in order to

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[1]U.S. EPA. 1998. Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units—Final Report to Congress.

[2]State and Local Agency Stakeholders included NESCAUM, STAPPA/ALAPCO, the State of New Jersey, and the Regional Air Pollution Control Agency (RAPCA) based in Dayton, Ohio. (The State of Texas also participated in the Working Group, but preferred to offer a separate opinion on several issues.)

[3]Environmental Stakeholders included the Clean Air Task Force, National Wildlife Federation, National Environmental Trust, Natural Resources Defense Council, and Environmental Defense.

[4]The Clean Energy Group was represented in the Working Group by PG&E National Energy Group. Two of its members, Consolidated Edison and Public Service Enterprise Group, also participated in the Working Group. Other Clean Energy Group members include Conectiv, Exelon Corporation, KeySpan, Northeast Utilities, and Sempra Energy.

[5]The Majority Industry Group was represented principally by Cinergy, the Class of 85 Regulatory Response Group, Latham & Watkins, the National Mining Association, Seminole Electric Cooperative, Southern Company Generation, the United Mine Workers, the Utility Air Regulatory Group, West Associates, the American Public Power Association, and the National Rural Electric Cooperative Association.

[6]"Areas of Agreement Among Stakeholders in the Utility MACT Working Group," Memorandum dated October 30, 2002.

translate each group's recommendations into the annual tons of mercury that would be released to the environment. Notwithstanding this analysis, NESCAUM urges EPA to model the stakeholder group recommendations with IPM, consistent with its original representations, in order to provide a more complete picture of the emissions impact of implementing various policy options for regulating mercury from power plants.

2.0 Methodology

The total mercury tonnage that would be emitted under each stakeholder group's MACT recommendation was calculated using the underlying fuel consumption data and uncontrolled mercury emissions information reported in EPA's Utility Air Toxics Study data base. This analysis does not attempt to project growth in fuel consumption, nor does it model changes in the methods of electricity production. Such a dynamic analysis would require the use of a system dispatch model like IPM. However, we are confident that this analysis provides reasonable estimates of the annual tons of mercury that would be emitted by the electric power sector under each of the scenarios considered.

All of the stakeholder group recommendations were analyzed using a subset of the power plants in the EPA Utility Air Toxics Study data base.[7] Plant-by-plant mercury emissions estimates were downloaded from EPA's website.[8] These data were compared with mercury input concentrations in the coal purchased by power plants, which was compiled from first, second, third and fourth quarter 1999 coal data downloaded from the same source.[9] There were 412 power plants for which both coal data and EPA plant emissions estimates existed for mercury. These 412 facilities—emitting an estimated 44.6 tons of mercury in 1999—were included in the analysis. EPA estimates that the entire universe of facilities in its Utility Air Toxics Study data base emitted approximately 48 tons of mercury in 1999.

Because the State and Local Agency Stakeholder group recommendation did not include lignite, coal-fired power plants that reported lignite as their primary coal type were excluded from the analysis of that group's recommendations, eliminating 11 facilities. These 11 facilities generated an estimated 3.1 tons of mercury emissions in 1999. Eliminating these 11 facilities left 401 coal-fired power plants available for the analysis of this stakeholder group's MACT recommendation. In 1999, these 401 power plants emitted an estimated 41.5 tons of mercury.

In converting the stakeholders' recommendations to annual mercury emissions in tons, the analysis assumes that those sources whose emissions are already below the recommended limits will not increase their emissions to the maximum allowable level.

3.0 Analysis of Stakeholder Group Recommendations

Annual emissions in tons of mercury from electric power plants after the MACT standard is implemented are estimated below for each of the recommendations of the four stakeholder groups. The results of this assessment are summarized in Appendix A.

3.1 State and Local Agency Stakeholder Group

Recommendation: The State and Local Agency Stakeholders recommended a plant-by-plant standard equivalent to the less stringent of 0.4–0.6 pounds per trillion British thermal units (lbs/TBtu) or a 90 percent reduction (from the mercury content in coal). This standard would only apply to bituminous and subbituminous coal. This stakeholder group did not submit a recommendation for plants burning primarily lignite.

Two approaches were analyzed. The first allowed sources to choose between complying with a rate-based emission standard of 0.6 lbs/TBtu or a 90 percent reduction from the mercury content in coal. It was assumed that sources would select the less stringent of these two compliance paths. Using this approach, of the 401 facilities included in this stakeholder group's analysis, 47 facilities would continue to emit at current levels (i.e., current emissions are below the proposed standard), 188 would choose to comply with the 90 percent control efficiency option, and 166 would choose to comply with the emission rate standard of 0.6 lbs/TBtu. Overall, this would result in annual mercury emissions of approximately 6.7 tons.

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[7]This was necessary because certain data were not available for a small subset of the facilities in the EPA Utility Air Toxics Study data base.

[8]"Plant by Plant Emissions Estimates," Wordperfect file downloaded March 26, 2002 from http://www.epa.gov/ttn/atw/combust/utiltox/utoxpg.html.

[9]Data base compiled by Michael Aucott of the New Jersey Department of Environmental Protection.

The second approach allowed sources to choose between a rate-based emission standard of 0.4 lbs/TBtu or a 90 percent reduction. Using the method applied above, 43 of the 401 facilities included in the analysis would continue to emit at current levels (i.e., current emissions are below the proposed standard), 306 would choose to comply with the 90 percent control efficiency option, and 52 would choose to comply with the emission rate standard of 0.4 lbs/TBtu. Overall, this would result in annual mercury emissions of 6.3 tons.

3.2 Environmental Stakeholder Group

Recommendation: The Environmental Stakeholders recommended a plant-by-plant standard of 0.19 lbs/TBtu for fluidized bed combustion (FBC) facilities and 0.21 lbs/TBtu for all other facility types. This standard would apply to all coal types.

The Environmental Stakeholder Group's recommendation applied to all coal types, allowing the 11 lignite-burning plants to be included in this analysis, yielding a total of 412 facilities for which adequate data were available to assess the emissions impact of the recommended standards. Overall, the Environmental Stakeholder Group's recommended standards would result in annual mercury emissions of 1.9 tons.

3.3 Clean Energy Group Recommendation

Recommendation: The Clean Energy Group recommended a plant-by-plant standard of 0.320 lbs/TBtu for FBC facilities burning bituminous or subbituminous coal, 1.223 lbs/TBtu for all other boiler types burning bituminous or subbituminous coal, 11.984 lbs/TBtu for FBC facilities burning lignite, and 9.091 lbs/TBtu for all other boiler types burning lignite. Although CEG has indicated it would support a standard allowing sources to comply with either a specified emission rate or a specified control efficiency, CEG made emission rate recommendations only based on its understanding that IPM cannot model control efficiency standards.

The Clean Energy Group's recommendation was applied to all 412 facilities for which adequate emissions data were available. Overall, the Clean Energy Group's recommended standards would result in annual mercury emissions of 13.1 tons.

3.4 Majority Industry Group Recommendation

Recommendation: The Majority Industry Group recommended a plant-by-plant standard of 3.7 lbs/TBtu for hot stack facilities burning bituminous coal, 2.2 lbs/TBtu for saturated stack facilities burning bituminous coal, 3.2 lbs/TBtu for wet stack facilities burning bituminous coal, 4.2 lbs/TBtu for facilities burning subbituminous coal, 6.5 lbs/TBtu for facilities burning lignite, and 2.0 lbs/TBtu for FBC facilities.

NESCAUM did not have access to data regarding the stack characteristics of the facilities burning bituminous coal (i.e., hot, saturated, or wet), and thus was unable to precisely convert the Majority Industry Group's recommendation into total tons of mercury emitted annually. We bracketed the range of annual emissions, however, by calculating tons emitted from facilities burning bituminous coal assuming: (1) that for the low (most stringent) end of the range, all such facilities would comply with the lowest recommended emission rate of 2.2 lbs/TBtu, and (2) that for the high (least stringent) end of the range, all such facilities would comply with the highest recommended emission rate of 3.7 lbs/TBtu. Emission rates for other facilities and fuel types were applied as recommended. Overall, the Majority Industry Group's recommended standards would result in annual mercury emissions between 25.0 and 30.0 tons.

4.0 Discussion

Under the Federal Clean Air Act, the mercury MACT standard for the electric generating sector is required to be proposed by December 2003, promulgated in final form by December 2004, and is expected to be implemented by December 2007. Thus, under the existing Clean Air Act (i.e., unmodified by any Federal multi-pollutant legislation applicable to the power sector), the public can expect reductions in mercury pollution from power plants to occur by the end of 2007.

It is difficult to predict the level at which EPA will ultimately set the mercury MACT standard. However, it is worth noting that some States have already moved to adopt mercury standards in the range of stringency recommended by the State and Local Agencies Stakeholder Group and on a similar timeline to that expected under the Clean Air Act for implementation of a Federal MACT standard. In March 2003, for instance, a coalition[10] of an electric generating company and several environmental groups publicly issued a joint recommendation to the Connecticut Gen-

[10]This coalition included PSEG Power Connecticut, Clean Water Action, the Connecticut Coalition for Clean Air, and the Clean Air Task Force.

eral Assembly calling for legislation establishing stringent mercury emission standards for Connecticut's coal-fired power plants. Specifically, their proposal would require coal-fired plants in Connecticut to achieve either a mercury emission rate of 0.6 lbs/TBtu or a 90 percent control technology efficiency by July 2008. The proposal further directs the Connecticut Department of Environmental Protection to consider new emissions standards for mercury in 2012. Similarly, the Massachusetts Department of Environmental Protection has concluded that the removal of at least 85–90 percent of mercury in flue gas has been demonstrated to be technologically and economically feasible.[11]

5.0 Conclusion

This analysis was conducted to facilitate comparisons among different Stakeholder Group recommendations within the EPA Utility MACT Working Group process and several legislative proposals currently before Congress to reduce multiple types of pollutant emissions from the power sector, including mercury. Most of these legislative proposals would set aside the MACT process authorized under the Clean Air Act and would address power plant mercury emissions directly, in most cases by establishing a national cap on power sector mercury emissions and (in some cases) also establishing facility-specific minimum mercury reduction requirements. An important dimension of all of these proposals is the timeframe over which mercury reductions would be implemented. As noted several times in this discussion, under current law new MACT standards will be implemented by the end of 2007. By comparison, at least one proposal now before Congress delays full action on mercury for more than a decade compared to the mercury MACT process.

The consequences of delay in implementing new mercury control requirements are potentially significant in terms of foregone reductions in the quantities of this persistent, bio-accumulative toxin that will be released to the environment over the next 10 to 15 years. Compared to the MACT recommendations of the State and Local Agency Stakeholder Group, for example, the more delayed legislative proposal noted previously would result in the allowable emission of an additional 258 tons of mercury between 2007 and 2020. Even assuming EPA picks a less stringent MACT standard representing a middle ground between the more centrist Stakeholder Group recommendations summarized in Appendix A, foregone emissions reductions relative to the more delayed legislative proposals now before Congress could be significant. For example, utilizing the same comparison as above, a MACT standard equivalent to an annual cap of 11 tons—if implemented in 2008—would likely reduce cumulative emissions by more than 180 tons by 2020, compared to a phased approach that delays similar levels of control for another 10 years. This represents approximately 4 years worth of mercury emissions at current emission rates (44.6–48.0 tons per year). Due to its persistence in the environment, any additional mercury emitted as a result of delaying new control requirements will remain bioavailable for years, needlessly accumulating in the food chain that ultimately reaches humans.

We hope that the results of this analysis will help avoid lost opportunities of this nature by providing useful guidance both to EPA in reaching its final mercury MACT determination for power plants and to policymakers in Congress as they consider multi-pollutant legislation incorporating mercury emission limits.

APPENDIX A.

SUMMARY OF ANALYSIS RESULTS

NESCAUM—May 5, 2003

Stakeholder Group	Recommended Mercury Emission Standard	Relevant Annual Baseline (tons)	Post-MACT Annual Emissions (tons)
Environmental Stakeholders	0.19 lbs/TBtu for FBC facilities. 44.6	1.9	
	0.21 lbs/TBtu for all other facility types for all coal types		
State and Local Agencies	0.4–0.6 lbs/TBtu or a 90 percent reduction, applied to bituminous and subbituminous coal.	41.5	6.3–6.7

[11]"Evaluation of the Technological and Economic Feasibility of Controlling and Eliminating Mercury Emissions from the Combustion of Fossil Fuel," Massachusetts Department of Environmental Protection, December 2002.

SUMMARY OF ANALYSIS RESULTS—Continued

NESCAUM—May 5, 2003

Stakeholder Group	Recommended Mercury Emission Standard	Relevant Annual Baseline (tons)	Post-MACT Annual Emissions (tons)
Clean Energy Group	0.320 lbs/TBtu for FBC facilities burning bituminous or sub-bituminous coal.		
1.223 lbs/TBtu for all other boiler types burning bituminous or sub-bituminous coal			
11.984 lbs/TBtu for FBC facilities burning lignite			
	44.6	13.1	
9.091 lbs/TBtu for all other boiler types burning lignite			
Majority Industry Group	3.7 lbs/TBtu for hot stack facilities burning bituminous coal.		
2.2 lbs/TBtu for saturated stack facilities burning bituminous coal			
3.2 lbs/TBtu for wet stack facilities burning bituminous coal			
4.2 lbs/TBtu for facilities burning subbituminous coal			
6.5 lbs/TBtu for facilities burning lignite			
	44.6	20.0–30.0	
2.0 lbs/TBtu for FBC facilities			

Senator JEFFORDS. The Administration's behavior on this issue makes me think they don't want information in the public domain if it might show the mercury caps in Clear Skies are above what is achievable and cost effective with today's technology. This failure to deliver promised information looks like intentional derailing of the Utility MACT Rule. At the right time, I hope the court enforcing the consent decree will note the Administration's bad faith on this

Mercury is a potent air toxic emitted by coal burning powerplants. Emissions must be reduced quickly and deeply. I ask that a letter on mercury from more than 200 State and local conservation organizations and officials be included in the hearing record.

Senator VOINOVICH. Without objection.

[The information referred to follows:]

205 STATE AND LOCAL CONSERVATION ORGANIZATIONS, BUSINESSES AND ELECTED OFFICIALS

May 7, 2003.

U.S. Senate and House of Representatives,
Washington, DC 20003.

DEAR SENATORS AND MEMBERS OF CONGRESS: As the Senate and House begin consideration of the President's air pollution proposal, introduced on February 27 by Senators James Inhofe and George Voinovich and Representatives Billy Tauzin and Joe Barton, it is critical that you are aware of our concerns that the bill moves the Nation backwards rather than forwards on air pollution. Rather than build on a firm foundation of the Clean Air Act, the President's bill severely undermines that foundation, leaving the public to rely solely upon a system of pollution caps that will allow higher emissions over a much longer period of time than current law. We strongly urge you to reject this approach.

This unfortunate reality is especially evident in the sections of the President's bill that address emissions of mercury, an extremely toxic heavy metal. Much of the mercury pollution emitted into our air ends up in our food chain, accumulating in fish, a staple of the American diet. The problem is widespread: 44 States have posted mercury advisories warning people to limit consumption of fish from 10,179, 247 acres of lakes and 414, 973 miles of rivers.

For those who eat mercury-tainted fish, the health risks are serious, especially for unborn infants and very young children whose neurological systems are developing.

- A recent study by the Centers for Disease Control Prevention estimates that 8 percent of women of child-bearing years in the U.S. have unsafe levels of mercury that put their children at risk for developmental delays, neurological damage and other health problems.
- As many as 300,000 children are born in the United States each year with a heightened risk for health effects related to mercury exposure.

As mercury contamination becomes a more pressing public health issue, businesses that support the recreational fishing industries stand to lose. The sport fishing industry alone generates more than $100 billion per year in revenues. This figure does not even begin to calculate the risk of mercury contamination to American businesses that depend on a robust market for fish sold in the grocery stores or at restaurants all across the Nation, nor does this number begin to value the loss of fish as a source of food for those who rely on it for their families or their way of life.

After years of research, EPA concluded in 2001 that it was necessary and appropriate to set mercury standards under Section 112 of the Clean Air Act for power plants, the largest industrial source, and a source which is currently unregulated. These standards, which are due to be proposed this year, will be based on technologies that can remove as much as 90 percent of the mercury in coal from power plant smokestacks before it is released into the air, bringing the national power plant mercury load down to roughly five tons per year by 2008. This level of protection is not only possible but absolutely warranted by the severity of the health concerns and the level of the economic threat.

It is therefore alarming that the President's pollution plan eliminates these standards entirely. Instead, the President proposed to impose a national cap on mercury emissions. However, that cap would allow power plants to emit 26 tons of mercury until 2018, after which time they could continue to emit 15 tons of mercury each year. Even at this late date, the mercury levels allowed by the President's plan are three times higher than levels that would result from vigorous enforcement of current law.

The President's plan weakens mercury protections in several other important ways:

- Under current law, coal-fired power plants would have stringent emission limits written into a permit. The President's bill would repeal source-by-source permitting, allowing polluters to "trade" mercury. It also would likely result in mercury emissions increasing at specific power plants, according to EPA.
- Under current law, EPA is required to impose stricter standards if risks to public health remain. The President's bill removes that public health safeguard.
- Under current law, new sources of mercury are required to meet stringent mercury emission limits. Under President's bill, controls would be imposed on new power plants only if "economically and technologically feasible" for the plants to comply.

Please take these concerns into consideration as you prepare to legislate on power plant emissions policy. We strongly urge you to reject any policy that weakens current law for any power plant pollutant and instead insist upon building on the strong foundation of the current Clean Air Act to strengthen public health safeguards.

Sincerely,

AL

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Birmingham, AL

AR

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Community Renewal Society
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Crossroads Christian Youth Center
Big Rock, IL

Delta Institute
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Human Action Community Organization
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Illinois Student Environmental Network
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Lyons Incineration Network
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MCS: Health & Environment
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Metro Seniors in Action
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National Council of Jewish Women

Prairie Sun Consultants
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Protestants for the Common Good
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SMART (Sensible Management of Aquatic Resources)

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Northwest Energy Coalition
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Washington Association of Churches
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Coalition For Environmentally Safe Schools
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Lutheran Public Policy Office
Tacoma, WA

Seattle Audubon Society
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Okanogan, WA

Transportation Choices Coalition, Spokane Chapter
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Senator JEFFORDS. I would also like to place into the record a letter from a coalition of public health and environmental organizations stating their support of the current Clean Air Act.

Senator VOINOVICH. Without objection.

[The information referred to follows:]

AMERICANS FOR CLEAN AIR

May 7, 2003.

The Honorable JAMES INHOFE, *Chair,*
Committee on Environment and Public Works
U.S. Senate
Washington, DC 20510

The Honorable BILLY TAUZIN, *Chair,*
Committee on Energy and Commerce
U.S. House of Representatives
Washington, DC 20515

Dear Chairman Inhofe and Chairman Tauzin: For over three decades, the Clean Air Act has worked to improve public health and protect the environment. We, the undersigned health, senior's, religious, labor, civil rights, children's, parent's, women's, consumer and environmental organizations strongly support the Clean Air Act and vigorously oppose legislation that will weaken or delay the implementation of the law.

The Clean Air Act is working. By enforcing the law, air pollution levels have dropped at the same time the nation's economy has grown dramatically. The Clean Air Act amendments that you have introduced at the request of the administration would disrupt this progress, harm public health and worsen global warming. If the Clean Air Act is changed, it should be strengthened, not weakened.

Today, the Clean Air Act is designed to protect the health of all Americans. Pregnant women, children, people with heart disease and lung diseases (such as asthma and emphysema), seniors and other populations at risk for diseases like cancer must be protected from the harmful effects of poisonous mercury in our waters, toxic air pollution, smog and soot. America's National Parks and other unique landscapes must be protected from air pollution, haze and irreversible damage to our environment.

The Clean Air Act sets strong standards to cut pollution from power plants and other industrial sources to meet the health-based air quality standards for soot and smog. Power plants are required to sharply reduce their sulfur and nitrogen emissions by the end of this decade. Current law also requires power plants to install state-of-the-art technologies that will deeply cut mercury contamination by 2008.

The Bush Administration's air pollution proposal weakens the Clean Air Act in several important ways. The bill delays deadlines to meet the health standards and relaxes pollution reduction requirements for power plants and other major pollution sources. The proposal repeals the requirement for power plants to install state-of-the-art pollution controls to reduce toxic mercury emissions. Critical states' authority to set strong clean-up standards is repealed. The plan also makes global warming worse by allowing carbon pollution to increase.

The current Clean Air Act provides critical tools that the states and the Environmental Protection Agency can use to achieve clean air. Please do not weaken industry's responsibility to clean up power plants and other smokestacks. Do not postpone

the requirements to meet health-based standards. Do not diminish the rights of downwind states to protect themselves from pollution produced outside their borders.

All Americans have a right to breathe clean, healthful air. That is the promise of the landmark Clean Air Act. This promise should never be broken.

Sincerely,

Alpha-1 Foundation.
American Association of People with Disabilities.
American Cancer Society.
American Heart Association.
American Lung Association.
American Public Health Association.
American Thoracic Society.
Asthma and Allergy Foundation of America.
Breakthrough Technologies Institute.
Center for International Environmental Law.
Central Conference of American Rabbis.
Children's Environmental Health Network.
Citizens Coal Council.
Citizens for a Better Environment.
Clean Air Task Force.
Clean Air Trust Education Fund.
Clean Water Action.
Clear The Air.
Climate Solutions.
Coalition on the Environment and Jewish Life (COEJL).
Consumer Action.
Defenders of Wildlife.
Environmental Defense.
Environmental Defense Center.
Environmental Integrity Project.
Friends Committee on National Legislation.
Friends of the Earth.
Green House Network Greenpeace.
Healthy Schools Network.
International Primate Protection League.
Kids Against Pollution.
League of Conservation Voters.
League of United Latin American Citizens.
League of Women Voters of the United States.
National Adult Day Services Association.
National Association for the Advancement of Colored People (NAACP).
National Association of the County and City Health Officials.
National Audubon Society.
National Consumers League.
National Council on the Aging.
National Environmental Trust.
National Parks Conservation Association.
National Wildlife Federation.
Natural Resources Defense Council.
OMB Watch.
Our Children's Earth Foundation.
The Ocean Conservancy.
Physicians for Social Responsibility.
Presbyterian Church (USA) Washington Office.
Public Citizen.
Public Employers for Environmental Responsibility.
Religious Action Forum.
Sierra Club.
Trust for America's Health.
Union of American Hebrew Congregations.
Union of Concerned Scientists.
United Church of Christ Justice and Witness Ministries.
United Methodist Church General Board of Church and Society.
United Steelworkers of America.
U.S. Environmental Watch.
U.S. Public Interest Research Group.
Wildlands CPR.
Women's Environment and Development Organization.
Women's International League for Peace and Freedom.
Woman's National Democratic Club.
Working Assets.
20/20 Vision.

Senator JEFFORDS. Finally, most projections indicate that new electricity generation will come largely from natural gas for mainly economic reasons. Most of that generation will be for peaking power and those natural gas facilities that are new baseload will be replacing older, inefficient natural gas-fired plants and not replacing coal.

According to the testimony of today's witnesses and the experts in the natural gas industry, there will be plenty of natural gas to

meet the projected growth of demand for electricity but if coal wants to expand its market share beyond the current 55 percent it now enjoys and really grow, then the test is simple, produce power that meets public health and environmental needs of America today and into the future.

Thank you, Mr. Chairman.

Senator VOINOVICH. Thank you, Senator Jeffords.

Mr. McSlarrow, we apologize for holding you up this morning. We had a very important vote in the U.S. Senate that I was particularly interested in, the legislation to open up NATO to seven new nations. It is a historic day for those nations and for our country and the future of NATO organizations. I apologize for not getting started on time.

We are very happy to have you here today and look forward to your testimony.

STATEMENT OF HON. KYLE E. MC SLARROW, DEPUTY SECRETARY, U.S. DEPARTMENT OF ENERGY

Mr. MCSLARROW. Thank you, Mr. Chairman.

With your permission, I would like to briefly summarize my testimony and submit it in full for the record.

I am pleased to appear before you today to discuss the Administration's National Energy Policy and to discuss why we think Clear Skies is a critical component as you said of the President's strategy to confront both our energy and environmental challenges. We are pleased the Senate is now considering a comprehensive energy bill and commend Chairman Domenici and the members of his committee for acting so swiftly. We commend you, Mr. Chairman and this committee for moving aggressively to consider the Clear Skies legislation.

The Nation's demand for electricity is projected to grow significantly over the next 22–25 years. Between now and 2025, the United States will likely have to add between 446 and 665 gigawatts of new generating capacity to meet growing demand. This is equivalent to adding the entire power generation sector in Germany and Japan combined to the U.S. power grid. Concurrently, with this expansion of the Nation's power fleet, power generators will also be called upon to make new investments in pollution control technologies to meet tightening environmental standards.

Over the past 25 years, America's electricity utility industry has invested billions of dollars in advance technologies to improve the quality of our air. In terms of long term energy trends, we long ago ceased to fully provide for our petroleum needs domestically and though most of our natural gas demand can be met with North American production, the trend here is also toward a greater share of imported natural gas. Coal, our most abundant energy resource, is actually projected to reduce its percentage share of electricity generation.

President Bush recognized that to prevent these problems from becoming a permanent feature of American life, we needed a long term plan. President Bush's National Energy Policy released in May 2001 reflected a few fundamental principles. First, we need to maintain a diversity of fuels from multiple sources. Second, we

should seek opportunities for increased investment trade, exploration and development which are increasing every year far beyond the traditional markets of the last 50 years. Third, we should focus research and development on initiatives that seek long term solutions to our energy challenges as we have done with energy efficiency, renewable energy, hydrogen, fusion and nuclear energy as well as the recently announced zero-emission FutureGen coal project.

The National Energy Policy also highlighted the growing need for attention to the Nation's electricity markets and infrastructure. We strongly believe that Clear Skies is a key component to meet that goal as is a comprehensive energy bill that includes a sound electricity title to modernize our wholesale electricity markets. A well functioning, wholesale market brings its own rewards. As confidence is gained that the system is reliable and capable of coping with the high demand for electricity, there will increasingly be less need for restrictive and prescriptive regulation. That is the point when much needed investment is likely to be attracted—investment in new technologies and improved generation and transmission facilities that produces additional energy and environmental benefits.

When the opposite is true, when uncertainty reins, when reliability is questioned, when prices seem detached from market forces, investment vanishes. The present uncertainty in the wholesale electricity market is not simply affected by policy choices that center on transmission assets and market designs. The uncertainty extends to the generation of electricity itself and that is why it is so important to provide greater regulatory certainty about the kinds of investment choices the generating industry will have to make over the next two decades. We believe the Clear Skies proposal does just that.

It is difficult to quantify what the cost to our energy impacts will be if multi-pollutant legislation is not enacted. The Energy Information Administration from which most of our numbers are drawn, the EIA baseline, includes all future legislation and regulations that have been specified or enacted but does not include regulations not yet promulgated. Therefore, we know in the absence of this legislation before the committee, mercury regulations will be promulgated by December of next year but we do not know what those regulations will be. We can anticipate that additional regulations on SO_2 and NOx will be required but we do not know what those regulations will be either. We can anticipate additional regulations to reduce regional haze, but again, we don't know what they will be.

What we should be concerned with is this. Uncertainty, delay and litigation which are the chief hallmarks of the current process under the Clean Air Act are not likely to produce greater environmental benefits but instead are likely to lead to more costly solutions and risk affecting the energy fuel mix in ways that are unwarranted and unforeseen. Although we have not contrasted Clear Skies to this unknown regulatory future, we have compared it to a future predicated on current control programs.

Under Clear Skies natural gas consumption, which is currently projected to increase to about 35 trillion cubic feet in 2025 in-

creases to 36 trillion cubic feet, 1 tcf additional. However, we do not project that a significant change in natural gas supply is needed due to the implementation of Clear Skies. Wellhead natural gas prices follow the baseline pattern after decreasing from the unusually high prices that occurred in 2001.

Clear Skies helps maintain coal as an important fuel source, thereby avoiding excessive pressure on natural gas prices. In our baseline, coal consumption would increase about 38 percent through 2025. Under Clear Skies, it increases to a lesser extent but still an increase of 26 percent. EIA also projects electricity prices will lower throughout the projection period for both the baseline scenario and under Clear Skies. The effect of emission reductions is roughly a 0.3 cents per kilowatt hour price increase.

In closing, one of the concerns we have is the ever increasing reliance on natural gas. Because our marginal supply of natural gas will increasingly come imported liquefied natural gas, we should be concerned that we not place too much stress on the natural gas supply by forcing a level of fuel switching from coal to gas that leads to higher volatility and higher prices. Natural gas supply as a low cost, reliable source of electricity is not automatic. One only has to witness the winters of 2000, 2001 and the one we just experienced to see the point. It is therefore critically important that we maintain a balanced, diversity of fuels to provide low cost and abundant electricity. The key to this is that we not assume that all policy objectives can be achieved simply by unlimited reliance on natural gas.

Thank you.

Senator VOINOVICH. Again, we want to thank you for being here this morning.

I understand the Natural Petroleum Council is currently working on a natural gas report that was requested by Secretary Abraham last year. This report follows a similar report issued by the NPC in 1999 which I will, without objection, enter into the record.

[The document is printed in the appendix to this hearing record:]

Senator VOINOVICH. Can you give us any idea of the scope of that report and when it is going to be released?

Mr. MCSLARROW. I believe the target for release is September. The scope of the report is much the same as the 1999 report which is a comprehensive look at both the supply and the demand side of the natural gas equation, as well as a look at technologies for exploration and production.

The reason it was asked for is because as you know there is a significant debate going on right now in the natural gas industry about the future of supply and demand in this country. There are increasing concerns about whether or not and to what extent we are going to meet our needs with domestic or at a minimum, North American production. I can't tell you at this point obviously the conclusions of that report will be. I have been briefed on interim analyses but I would say this. Nothing I have seen right now leads me to any other conclusion than that we have a looming problem in natural gas supply.

Senator VOINOVICH. What does the Administration believe are the potential effects on our manufacturing sector of any policy or legislation that will result in massive fuel switching from coal to

natural gas? Have you calculated what impact that would have on the economy of this country?

Mr. MCSLARROW. I am unaware.

Senator VOINOVICH. For that matter, what is already happening?

Mr. MCSLARROW. I am unaware of a calculation but I will go back and check and see if EIA has something and something for you for the record. There is no question that those industries with huge variable fuel costs, particularly with what has happened in natural gas, experience a huge crunch. If we have quantified it, I will get that to you.

Senator VOINOVICH. It is interesting because last week I had the man who is in charge of Bayer in the United States, with 22,000 employees in the U.S., who fundamentally said the cost of natural gas here was so much higher than it is in Europe and frankly, he was giving consideration to moving some of his operations back to Europe because of the high cost of natural gas. They are competing with these products in the global marketplace.

Who would have information on that type of thing, the Department of Commerce or who?

Mr. MCSLARROW. It is possible the Department of Commerce and also it is possible that our Energy Information Administration would have that as well as manufacturing groups themselves. We will do some research and get back to you.

Senator VOINOVICH. I would like to find out if there is anybody monitoring this at all in the Federal Government and we can get some statistical information.

Mr. MCSLARROW. There is usually a statistic for everything in the government, so I am sure it is there.

Senator VOINOVICH. an article in the Akron Beacon Journal last Sunday, which I will without objection enter into the record.

[The information referred to follows:]

[From the Akron Beacon Journal, May 4, 2003]

NATURAL GAS OUTLOOK: COSTLY

(By Jim Mackinnon)

This past long, cold winter, if followed with a long, hot summer, may leave Northeast Ohio natural gas users more under the weather than usual.

Natural gas supplies, already sharply depleted by a frigid winter that drove up heating usage, will come under even more pressure if prolonged hot weather this summer causes natural gas-powered "peaking" electric plants to fire up more than usual to meet air-conditioning demand. Those plants use a lot of natural gas and may be needed for sustained periods just when gas companies want to fill their underground storage systems ahead of next winter.

And it looks like Mother Nature may not provide much help. The latest National Weather Service long-range outlook says it is likely much of the Nation will have above-normal temperatures this summer.

The result may be higher-than typical prices for natural gas users, though producers and sellers such as Dominion East Ohio say we won't have to worry about running out of the fuel.

"This past winter is going to have a lot of repercussions," said Jeff Murphy, director of pricing and regulatory affairs for Dominion East Ohio. "All things considered, we're seeing a lot of upward pressure on prices."

Basically, that means tight supply, low production and increasing demand.

And while that may be good for natural gas producers, it's not for those who buy gas.

The latest Federal information shows 741 billion cubic feet of natural gas in underground storage nationally as of April 24—well below the more than 1.6 trillion

cubic feet stored in the same period a year ago. The 5-year average of natural gas storage for this time of year is about 1.3 trillion cubic feet, according to the Energy Information Administration.

To get some idea of how weather can play havoc with natural gas supplies as well as household heating bills, look at Dominion East Ohio customers.

They burned a lot more gas on average this past winter than during the previous year, Dominion East Ohio spokesman Neil Durbin said.

The average Northeast Ohio household from December 2001 through February 2002 burned 42.3 thousand cubic feet of gas, he said. From December 2002 through February this year, that average household burned 63.5 thousand cubic feet of gas, he said.

The end result: Way less natural gas left in underground storage by the time spring arrived.

"We're going to have to scramble to put gas in the ground. That will keep gas prices high," said Chuck Faber, director of corporate development for Twinsburg-based natural gas and oil explorer North Coast Energy Inc. The natural gas industry will want to have about three trillion cubic feet of gas stored in time for next winter to be comfortable, he said.

"We could see $7 (wholesale natural) gas in the summertime," Faber said. The wholesale price now is about $5 per thousand cubic feet. Residential customers pay more—there are taxes, and utilities tack on additional charges for transporting and delivering the gas to households, which is where they make their profit.

There could be price spikes, too, if hurricanes temporarily shut down natural gas production platforms in the Gulf of Mexico, Faber said.

Gas producers have been increasing well drilling, but North Coast and other companies remain reluctant to ramp up production dramatically, Faber said. The cost of drilling a 4,000-to 5,000-foot-deep well is between $160,000 to $180,000, while a 10,000-foot well can cost between $1.5 million and $2 million, he said.

In addition, it's been harder for drillers to get financing to put in new wells, said FirstEnergy Corp. spokeswoman Kristen Baird. The Akron utility produces, buys and sells natural gas for its own gas-fired peaking plants as well as for retail customers.

"We anticipate pricing will continue to be on the high end," Baird said.

The Energy Information Administration reports that natural gas production in the U.S. fell by 2.6 percent last year, but should increase by 1.5 percent this year. Even so, demand is expected to increase by 2.7 percent this year compared to last.

"The big gas wells are being depleted," said Peggy Laramie, spokeswoman for the American Gas Association, which represents the natural gas utility industry.

Because of supply and demand imbalances, the association feels that natural gas prices are going to fluctuate a lot more than they did in the late 1990's, Laramie said. To increase supply, the association and its members are lobbying the Federal Government to relax regulations and allow them to drill for natural gas in places now off limits to them.

The Federal Government, meanwhile, is looking to ensure that companies don't engage in price fixing or other illegal means to boost prices and profits.

It's not all bad news for consumers out there.

John Tobin of the Colorado-based Energy Literacy Project said North America gas supplies are vast. But while the supply is there, getting it to customers by drilling and putting it in pipelines is proving more difficult, he said.

Tobin said he thinks competition from lower petroleum prices will help moderate natural gas prices. Energy sources have to compete against each other, he said.

But Faber at North Coast Energy said his outlook is that natural gas will trade and sell at a premium relative to oil, even though traditionally oil has been more expensive than gas. Part of that has to do with the increased demand for gas, which burns more cleanly than oil, and the ability of oil to be more easily transported, he said.

Wellhead prices—basically, wholesale prices—are well down from their peaks in February and early March.

Nationally, the wellhead price of natural gas in the 2002–2003 winter heating season averaged $4.44 per thousand cubic feet, $2.08 more than the previous winter, according to Federal data.

But don't expect to see the return of $2 per thousand cubic feet wellhead prices, energy analysts and others said. They estimate wellhead natural gas will range between $4.50 and $5.50 per thousand cubic feet through at least the summer and probably into 2004.

For huge industrial consumers of natural gas, the higher costs eat away at profits.

Besides its use in heating buildings and making electricity, natural gas is a key component for fertilizer makers, polymer companies and the steel industry.

The Timken Co. burns about 8 billion cubic feet of natural gas a year, said Peggy Claytor, senior government affairs specialist for the Canton maker of bearings and specialty steel. Claytor, the company's former energy purchaser, specializes in energy and environment issues for Timken.

About 92 percent of the gas Timken uses is used to heat treat bearings and steel, with the remainder used for such things as heating boilers, she said.

While Timken and other companies can hedge the financial costs of gas, they often have to eat the higher energy costs, she said,

"You do not have the luxury of shutting down (a plant) because you have customer obligations to meet," Claytor said.

The higher prices have been a strong incentive for Timken and other companies to become more energy efficient, she said. Timken's changes have lowered the its natural gas consumption by 34 percent, she said.

The recession and slow economic growth have also moderated natural gas prices by reducing industrial and business demand, she said.

"An economic recovery will put more pressure on prices," Claytor said. "In a sense, we are fortunate that our economic recovery has been anemic."

Senator VOINOVICH. Highlights the pressures placed on natural gas supplies by the frigid winter that we had in Ohio and notes that the National Weather Service is predicting that much of the Nation will have above normal temperatures this summer. If hot weather this summer causes natural gas power plants to operate at higher than average levels, what impact will that have on our natural gas supplies and prices?

Mr. MCSLARROW. It will have a huge impact. We have a problem right now. We are coming out of a season in which we had low storage. This is the time when you traditionally build storage all the way through the summer to get ready for the next winter heating season. The last numbers I saw were that we were about 700 billion cubic feet in storage which is about 500 billion cubic feet below the 5 year average.

If we have a hot summer and natural gas is consumed in greater amounts for the generation of electricity for air conditioning and the like, we are going to go into the next winter even lower than we did the last. That puts us at risk for a lot more higher and volatile prices.

Senator VOINOVICH. We have been joined by Senator Carper. Senator, would you want to make a statement or ask Mr. McSlarrow some questions?

Senator CARPER. Is Senator Jeffords next in line to ask questions?

Senator JEFFORDS. Yes, but I will defer.

Senator CARPER. Let me defer to you and then I have some welcoming comments for Mr. McSlarrow. I have just had an exciting train ride from Delaware this morning. I want to calm down just a little bit before I say anything.

Senator VOINOVICH. Senator Jeffords?

Senator JEFFORDS. I just have one question. How many coal plants does the Administration project are going to switch to natural gas due to the environmental regulations over the next 10 years?

Mr. MCSLARROW. I don't have a number off the top of my head. We will get that for the record.

Senator JEFFORDS. I would appreciate that because obviously this is a very difficult question in the sense of the future of this country and our energy costs.

Senator VOINOVICH. Senator Jeffords, I can say this to you. All of the new powerplants in Ohio that have been built, and there have been a lot of them, are all fueled by natural gas.

Senator Carper?

OPENING STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR FROM THE STATE OF DELAWARE

Senator CARPER. I have calmed down.

Deputy Secretary McSlarrow, how are you doing?

Mr. MCSLARROW. Very well, Senator.

Senator CARPER. Glad you are here and glad you are in your position.

I get to come over and spend some time with your boss this afternoon. I am looking forward to that as well. It has to be a busy time for you with the energy bill coming to the floor. A good deal of what we will discuss there actually has some ramifications for what we are covering here as you know.

I have introduced, along with Senator Chafee and Senator Gregg, legislation to attempt to slow the growth of emissions of CO_2 principally from our utilities in this country. I did not have a chance to hear your testimony this morning but I am mindful of the concern that some have raised and I hear a little here today about if we adopt a fourth pollutant, address CO_2 in clean air legislation this year, we will exacerbate the shift from coal to natural gas.

Let me say by way of a disclaimer, I know I am the only United States Senator who was born in West Virginia and I still have a lot of family there and a lot of affection for that State and its economy. It is not driven entirely by coal but it is still a major part of the economy of my native State. I am not interested in doing anything that is going to harm that industry or West Virginia, for that matter.

I just heard the chairman say in Ohio all the new utility plants that have come on line of late have been natural gas in nature. I think the same is true in Delaware. That has happened with a three pollutant bill. It just happened because of concern of States and industry to clean up the air. For the most part, it is easier and maybe cheaper for them to move toward natural gas than coal.

I want to make a couple of points and I would be interested in your thinking on this as well. There is a fair amount of uncertainty within the investment community on whether or not they ought to invest in utilities that are making major investments in coal-fired plants. We have heard testimony about the emissions from clean coal technology that are really just as good as what you are going to find in natural gas-fired plants but there is a reluctance on the part of investors to invest in companies or utilities that are going to bring those on line because they don't know if we are going to pass a 3-P or 4-P bill. They don't know if it is going to be a market driven system, will there be caps and trades available, and are just uncertain of the nature of what we are going to do legislatively and what you will be doing regulatorily. Are we going to make any changes in new source review. There is a lot of uncertainty.

One of the reasons why I am interested in a 4-P bill that addresses carbon dioxide is I want to provide some certainty. I want

to provide some certainty to the utilities and I want to provide some certainty to the investors as well.

I have seen information that suggests if our legislation, the legislation that Senators Chafee, Gregg and I have introduced, were to become law there would be I am told a 3 percent further shift from coal to natural gas. I don't want to even see that.

That is a round about way of asking this question. Let's talk about the willingness of investors to invest in clean coal technology and how that willingness might be driven, increased, enhanced by some certainty with respect to what we are going to be doing on new source review and whether or not we are going to be regulating carbon.

Mr. MCSLARROW. There is no question that certainty is in some ways at the center of much of the debate and at the center of much of the concern, both in terms of those who would invest in utilities and in particular kinds of plants and those who actually have to operate them and those who have to produce fuels.

My initial point would be we can provide certainty about passing Clear Skies, that would provide certainty, but to be fair to the question you asked, I think we really do have a concern. The numbers I have seen on your bill are a little larger in terms of the fuel switching but I also understand you just introduced a new version, so it's possible there is a difference between last year and now.

This is about marginal costs. This entire energy debate whether natural gas, coal or anything else in terms of what drives the cost of fuel in the electricity generation sector and the more we switch to natural gas and the more we have that effect, and there is no question that any bill that has a carbon cap is going to have some effect in a way that 3-P bill won't, is going to increasingly place this kind of pressure on natural gas at a time when it's already volatile in our view, and not very well understood as a driver of all the generation costs for all the other fuels.

There is no question that we have uncertainty surrounding the new source review rulemakings but again, as soon as we complete them, we will have certainty. The great thing about Clear Skies is that by making very clear the targets and allowing people the kind of time to make the investment decisions, not so much in the assets themselves but in the technologies that can control the emissions, we think gives the kind of confidence at least in the discussions I have had with market analysts, then the kind of confidence that this is worth investing in. They understand the rules of the road and are pleading for them. They also know that they are reasonable and achievable. I think we have a game plan right now that does that.

Carbon caps, putting aside the entire policy debate about carbon and focusing on energy impacts, the scary thing about carbon caps is we don't understand the control technologies necessary to deal with it. We do have some understanding, and are putting a lot of money into, carbon sequestration. For example, as you well know, the President has proposed a billion dollar FutureGen coal plant, not just to produce electricity and hydrogen but also to demonstrate how you can divert a carbon stream and sequester it.

I think we need to do those things first. We have a lot of work to do to understand how to deal with these things let alone before

you get to the policy debate of whether or not you should deal with it.

Senator VOINOVICH. I'd like to point out, Senator Carper, our third hearing will deal with emissions technology and the issues surrounding financial stability.

Senator CARPER. Great.

Senator VOINOVICH. What the investors have to say about the current situation as contrasted to Clear Skies or hopefully we will even get into talking about what Senator Jeffords offered last year with his legislation. Do you have more questions?

Senator CARPER. Maybe a point and maybe a short question.

I mentioned the numbers I have heard, 3 percent increase in terms of shifting from coal to natural gas that might be driven by our legislation. While I am not interested in seeing a 1 percent shift, it is not as great as some had feared.

The other number I would share is if we pass a 4-P bill or a 3-P bill, there are going to be certain costs incurred by generators of electricity that will be driven by that. If we add a fourth P or add carbon to that, there are some additional costs. The numbers we understand have been driven not by us but by more objective people than the authors of the bill, suggest that the additional cost to utilities would be about 2 percent.

If those numbers are indeed correct, a 2 percent additional cost by adding a fourth P, and a 3 percent shift from coal to natural gas, I think it is important that we figure out with some certainty if those numbers are correct and if they are, then we have to make the judgment of whether that is worth a tradeoff in terms of reducing the threat of global warming and what that poses for our country and for our planet.

My own view is those are costs that are worth assuming given the benefit although that is one about which reasonable people will disagree.

Let me ask you more of a personal question. Senator Voinovich has heard me talk about this before. I was not one to put a lot of stock in global warming for a long time. Kyoto accords came and went and I didn't pay a lot of attention to it. I didn't pay much attention to it until we had a couple of researchers from Ohio State University who came to Delaware a few years ago to receive a recognition and a major award.

The research they had done was for the last 20 years going around the world and climbing to the top of some of the tallest mountains in the world and measuring the disappearance of the ice caps and charting it for the last couple decades. I sat up and took notice. I have continued as we have gone forward since then.

Now I am in a position where we have the opportunity to do something about it and we have the President's proposal which is not to address it now but to do more research. We have Senator Jeffords' approach which is to do even more than utilities can do in a realistic manner.

Take off your hat as Deputy Secretary of Energy and do you think at all about global warming? Do you worry at all about what it poses to us? Is it something that has crossed your mind? Where are you as a human being on this one?

Mr. MCSLARROW. It is hard to testify as a human being.

Senator CARPER. It is hard for us to ask questions as human beings too.

Mr. MCSLARROW. Of course. I really don't know of anybody that doesn't think about it, debate it or argue it.

Senator CARPER. I think there are plenty of people who don't.

Mr. MCSLARROW. I would say this. The issue is one where I think on a personal level and I suspect for a lot of people it is one where you want to be right. You described a couple of alternatives but you left one out and that is what the President is doing on the subject. It is not like we are standing still. We have an aggressive, 18 percent greenhouse gas intensity reduction target in a decade.

Senator CARPER. I'm sorry, say that again?

Mr. MCSLARROW. An 18 percent reduction in greenhouse gas intensity.

Senator CARPER. It is an 18 percent reduction in growth and we are not talking about cutting it below what it is this year or next year?

Mr. MCSLARROW. Right.

Senator CARPER. But whatever it is going to be x number of years from now, we are going to reduce that growth by 18 percent?

Mr. MCSLARROW. Right. To the issue you raised which is where are you in terms of what you are worrying about. I think there is enough uncertainty about the science and on the effects and how we deal with it. We are spending $4 billion a year. This is what the President has requested to do the R&D on the science and technology but in addition to that, we are actually trying to at least put us in a position if down the road we get some certain answers to these questions we are in a position to deal with it.

I am comfortable with that as a human being and most importantly as the guy who works for the President because at the end of the day there is enough uncertainty about this that if we go another direction and risk not your bill but other proposals that I have seen, really devastating the coal industry and really placing us in a position where we are relying on natural gas which we are forecasting even without those kinds of measures is going to be doubling in terms of the liquefied natural gas imports we are going to have in another 20 years.

Senator CARPER. Mr. Chairman, I would like to say this as much to you as to our witness. I am a native of West Virginia but I represent Delaware now and have lived there for over 30 years. We have a lot of farming in our State and I know you do in Ohio. We have a lot of chemical plants, Dupont, Hercules and others in our State and I know you do in Ohio. I am mindful of the cost pressures that are coming to bear on those industries as well as others because of the jump in the price of natural gas. I am mindful of that and I know we need to keep our eye on the availability of natural gas and the price.

We are going to have an opportunity when we debate the energy bill over the next couple of weeks to consider things like a natural gas pipeline from Alaska and whether or not we should support that. We are going to have the opportunity to actually consider whether we ought to seriously study looking at some places off our coast for natural gas, places we haven't looked for a while. Those

are factors that need to come to this discussion as well. I am sure they will.

Thank you. It's good to see you.

Senator VOINOVICH. Thank you, Mr. McSlarrow. Thanks for being here.

Mr. MCSLARROW. Thank you, Mr. Chairman.

Senator VOINOVICH. Our next panel of witnesses consists of Mr. Jim Krimmel, President, Zaclon Chemical. Mr. Krimmel has testified before on the spike in gas prices in 2000–2001. Our next witnesses will be Mr. Richard Metz, Co-Executive Officer, UNIMARK, L.L.C., Mr. Steve Thumb, Principal, Energy Ventures Incorporated, Mr. Joel Bluestein, President, Energy and Environmental Analysis, Inc.

I would like the witness to know that we'd like you to limit your statements to 5 minutes. We would welcome to the record your complete statements.

We will start this morning with Mr. Krimmel.

STATEMENT OF JAMES KRIMMEL, PRESIDENT, ZACLON CHEMICAL

Mr. KRIMMEL. Thank you. It is very nice to see you again.

I want to thank the subcommittee for allowing me to speak here today. What I have to tell you is very simple. If you look at my testimony it is very simple stuff but it is very vital as well. It is vital to me, vital to my family, my employees and my employees' families. It is the story of the effect of the escalating natural gas cost on one small manufacturer, Zaclon Inc.

Zaclon is my company. We are located in Cleveland, Ohio. We are a producer of specialty chemicals as well as some bulk chemicals. We sell worldwide. We are the world's largest producer of zinc ammonium chloride galvanizing fluxes and we sell in 19 countries. We are a small company, 35 employees, less than $12 million in annual revenues, unfortunately. We not only have domestic competitors but our primary competitor is European and has been historically. Increasingly we are seeing the Asian competitors starting to penetrate the markets we are serving as well.

I am also currently the chairman of the Board of Directors of the Ohio Manufacturers Association. The OMA, with its 2,500 member companies, is the voice of manufacturing in Ohio and a vital part of the strength of Ohio's economy.

In the interest of time, I would like to the graphs I have included. I am kind of a visual person. If you would take a look at my first graph, it shows the energy costs for Zaclon Inc. over the past 15 years, the company has been in existence for 16 years. I don't know what happened to the data in our first year. I guess we weren't very efficient in those days.

This is an interesting chart in that it shows our energy costs, utility costs by medium, water, electricity, natural gas and you can see by far natural gas is our highest utility cost. You can also see that from 1999 to 2002, it shows a 63 percent increase in our natural gas costs.

This is interesting enough but it is much more telling if you combine it with sales. My next chart superimposes our product sales over our total energy costs. You can see here that despite declining

sales, our total energy costs have been increasing over the past 10 years.

The reason is largely fuel switching in my opinion coupled with inadequate exploration of natural gas. The fundamentals of natural gas have changed in the last 3 years. The volatility is unbelievable. It adds a level of uncertainty in our business that is very difficult to deal with. In the long run, as manufacturing recovers, as it will, and additional fuel switching occurs, the problem is only going to get worse. It is ont going to get better. That threatens the very existence of companies like mine, Zaclon and all 35 of our employees. It is not a huge number of employees but to all of us who have jobs, it is very important that we continue to be in business.

To further illustrate the changes in energy cost to Zaclon Inc. I included a couple pie charts and the pie charts show that in 1999, and this is true for the years prior to 1999, energy was 10 percent of my total cost picture, raw materials were 44 percent, labor 21 percent and all other costs amounted to another 25 percent.

The cost structure in 2002 shows energy is now 15 percent of my total cost. While we have been able to reduce raw material cost to 39 percent, labor has remained roughly steady and we haven't had to reduce people. I am trying desperately not to have to reduce people as a way of offsetting some of the increased energy costs. We are trying to improve efficiencies, we are doing that but it is just not enough. As natural gas continues to escalate, it is going to be more of a challenge for my company and my employees.

The final chart I show is a bunch of data points, 172 data points over 15 years of Zaclon's natural gas delivered price. If you look at data points starting at 134, 2001, you can see how the volatility and the price has increased, our delivered price for natural gas.

Prior to that time, we had seasonal peaks. We had the predictable winter peaks, some lower areas at lower prices during the summer but since 2001, that is simply not the case. The peaks are much higher and the average pricing is much higher. The last peak, the end of February, our delivered price of natural gas in March was over $11 per 1,000 cubic feet. I basically curtailed operations, I just couldn't afford to make product and sell it at that natural gas price.

In closing, I strongly urge you to serious consider what you do here and how it impacts the price of natural gas because it is so vitally important to my company and to others across the Nation, small, medium and even large manufacturers. We really want to keep these companies going, we want to keep the jobs there but we need some help too.

Thank you very much.

Senator VOINOVICH. Mr. Metz, Senator Inhofe asked me to welcome you as a resident of Oklahoma. I don't know whether he had a chance to say hello to you or not when he was here. We are glad to have you here today.

STATEMENT OF RICHARD METZ, CO-EXECUTIVE OFFICER, UNIMARK, L.L.C.

Mr. METZ. I represent a small company, 11 employees. I have been in the EMP side and the marketing side of oil and gas for 35 years and have concentrated over the last 10 years with the cre-

ation of UNIMARK. Our focus and function is to help small producers market their gas and at the same time, they will be discussing with me where the price of gas is going and what we can expect. As a result of that, I have tried to follow the marketplace and help them understand what my future forecast would be for prices or demand for gas so they can decide whether they want to put their funding capital into drilling additional wells and would they be able to get an economic return over the life of those.

I, like the gentleman to the right, have put together some graphs and included those with my testimony. If you look at Exhibit A of that, it is a graph of the production in the U.S. in bcf per day. Over time, we used to see a summer curtailment or decline in the consumption, therefore we had to have a summer curtailment or decline in the production. As additional demands are made on gas, that summer curtailment as you can see is going away.

Senator CARPER. Would you go back and take it from the top of Exhibit A?

Mr. METZ. Exhibit A is taking the EIA dry gas production data that is published monthly and determining a bcf per day. What are we producing? If you do it on a monthly basis, you get some strange things when February comes along and that kind of stuff. I revised the data to 1 billion cubic feet per day. This is the U.S. dry production after they process and treat it. That's what ends up in the pipeline to be consumed.

You can see back in the late 1980's, every summer there was a falloff in the production because there was a falloff in the demand. We had excess capacity. Prices reflected part of that. As the system has gone forward, we have trouble running in place, keeping up with our production last year because every year, those wells that are there are declining. So you have to add so many new wells to make up for the difference.

You can see starting in the early to mid 1990's, we are basically running wide open 365 days a year. Statistically, the same numbers in a table form says that since 1996, we have been producing 97 plus percent of the total peak production each year. So if you hiccup, you are in trouble. I am seeing that happening.

I am marketing as for 400–500 small producers primarily in Oklahoma. They are not curtailing gas, we are moving all the gas they have and they are out trying to find more. On the other hand, what is the future price going to be, what is the demand going to be. Those things are impacting their decisions. The energy business has been through a little turmoil in the last couple of years starting with Enron and others that things aren't a guarantee that what people say is going to happen will so they are a little more conservative.

Our drilling in the last 12 to 18 months has been more conservative and therefore, we are having trouble keeping just our gas levels where they are.

Exhibit C is somewhat like Senator Inhofe's graph showing where prices are and extreme volatility. When you have those kinds of numbers going up and down, he has trouble figuring out how he's going to market his product or make it a reasonable amount and the producer has trouble figuring out which prospects he should drill and will he get a reasonable return.

From that graph you can see the real deal is that people are more concerned there is going to be enough because the price goes up when a scarcity of the commodity. With those kinds of volatility, I want to say in the last week the price of gas as varied by more than 10 percent. That makes everyone nervous.

As the Administration witness discussed, the storage levels are extremely low. We are going to have to put in over 12 billion cubic feet a day between now and the end of October to get back to last year's levels. You can see on Exhibit D where we can be ready to meet the winter needs of a normal winter or colder in some areas as we had last year. Even though we drew down storage to the lowest levels than they have since they started keeping this information, last winter was not an abnormally cold winter across the U.S. Certain areas were, but on average we were 4 percent warmer than normal. So we have a real problem in filling up that storage. That is why we don't have summer curtailments anymore in production.

The bottom line, the producers would like obviously to see better prices; at the same time, they don't want those prices to cause displacement of industry and consumers. I think the biggest thing from the supply side is to be sure we don't make off limits certain onshore and offshore areas that could lead to additional production.

That is the bottom line of where I am coming from.

Senator VOINOVICH. Thank you.

Mr. Thumb?

STATEMENT OF STEVE THUMB, PRINCIPAL, ENERGY VENTURES INCORPORATED

Mr. THUMB. I am Steven Thumb and I appreciate the opportunity to present testimony before you today.

I am Energy Ventures Analysis' principal that is in charge of their oil and gas practice and have followed and participated in the industry for over 30 years.

You have written copies of my testimony, so I thought I would merely go forward with some major points. I am focusing on the impact of the proposed Clean Air requirements on the natural gas supply sector.

First, with respect to the current status of the natural gas supply sector, over the last 2 years, the gas supply has been challenged to meet the Nation's natural gas demand levels. This in turn has caused natural gas prices to reach record levels and demand destruction in the nonelectric sectors.

For example, in the industrial sector, natural gas consumption has declined 26 percent or 5.5 bcfd a day since 2000. Because a series of companies had to go bankrupt, idle capacity or essentially cut back production because they can't pass through the high cost of natural gas. In addition, the residential customer is seeing gas supply costs increase $17 billion.

The primary reason for the situation is U.S. production is declining and western Canada production can no longer fill the gap. More specifically, U.S. production has been declining for each of the last six quarters and the cumulative to date is a 3.5 bcf per day decline or 6 percent. As a way of comparison, that is out of an average consumption for the U.S. on an average basis of about 57 bcfd a day.

More important than this current challenge and its associated impacts is it is not going to go away for an extended period of time as a result of the combination of high decline rates for existing production and the limited increases in drilling activity. These latter two items have basically put the industry on a treadmill to maintain production, let alone to try and increase it.

The high decline rates of existing production in essence have reduced the average practical well life from about 10 years in the early 1990's to about 3 years today. With respect to the limited increases in drilling activity we have had despite these record gas prices, two of the major reasons are environmental restrictions and moratoria and the lack of scale for the remaining undiscovered reserves.

Concerning the latter item, this is the reason the major EMP firms left the shelf region of the Gulf of Mexico which historically has been the most prolific region we have had in the U.S. Basically, the large scale plays just aren't there. As a result, it is becoming increasingly clear that the U.S. gas supply sector just cannot depend on traditional sources of supply to meet projected increases in demand.

Instead, in the longer term, U.S. gas supply sector will have to rely on a series of emerging gas supply sources of which I noted six in my written statement to fill any gap between supply and demand. One of the key dilemmas with these emerging sources of supply is that they are for the most part very large, complex and capital intensive projects that will require an extended timeframe to develop.

My written testimony provided several examples of the complex and risky nature as well as the lengthy timeframe to develop these emerging resources. Included in these examples were industry's current delay in developing offshore eastern Canada, the long period of time it takes to permit and build new LNG terminals, and the fact the earliest the lower 48 will receive Arctic gas supplies will be 2009 and that will be from Canada's McKenzie Valley Pipeline Project.

With respect to the two Arctic gas pipeline projects, namely the McKenzie Valley and Prudhoe Bay projects, let me note that their combined initial capacity, net of incremental Canadian demand, is only 1.3 bcfd a day greater than the loss in current production levels over the last six quarters identified in my opening comments. That is a very small increase. The basic point is we are going to need that just to replace what we've lost.

Senator CARPER. Would you say that again? I want to make sure I understand what you just said.

Mr. THUMB. You have two projects, one coming down from McKenzie Bay and the other from Prudhoe Bay. Their combined initial capacity net of what Canada will need primarily for its heavy oil to sands projects will only be 1.3 bcfd a day greater than the loss in production we have seen from existing in the last six quarters.

With respect to the proposed Clean Air requirements, one of the significant impacts of those requirements is the proposed increases in the Clean Air requirements is that they will cause coal-fired generation to be reduced and as a consequence, gas-fired genera-

tion to increase. This has already happened under existing regulations. For example this year we had closure of the Possum Point coal plant in Virginia and the Gannon plant in Florida both of which were replaced by gas units on the same site. This increasing dependency on electric sector gas-fired generation which will only serve to exacerbate the problems or the challenge for the U.S. gas supply sector is already happening. Electric sector gas demand has increased, 45 percent or 4.7 bcfd a day since 1996. Of particular concern for the U.S. gas supply sector is the accelerated timetables and the higher emission requirements contained in some of the proposed initiatives as both will serve to only overload an already overloaded gas supply sector.

With respect to the increased production levels, of particular concern to the supply sector are the carbon dioxide limitations since the power industry has no viable control option and as a result must rely totally on switching generation to lower carbon containing fuels, primarily natural gas.

Of the various clean air initiatives you all are considering, S. 366 and S. 843 with their accelerated timetables for emission reductions and their larger emission reduction requirements, particularly CO_2 requirements, would represent an overload for the U.S. gas supply sector which would force the rest of the U.S. economy into hardship.

With respect to S. 485, it also represents a challenge for the U.S. gas supply sector. However, by eliminating the mandatory CO_2 requirements that are included in the other bills and by providing a longer implementation period for the required emission reductions, it may be at least manageable from a natural gas supply standpoint.

In summary, the U.S. gas supply sector is really struggling to meet existing demand. The acceleration of the proposed Clean Air requirements timelines and higher emission levels will only further raise gas prices. The empirical evidence to date clearly suggests that the net results of accelerated Clean Air requirements would be very high gas prices with all their attendant cost increases on the other sectors and demand destruction within the non-electric sectors.

Thank you for your time.

Senator VOINOVICH. Thank you, Mr. Thumb.

Mr. Bluestein?

STATEMENT OF JOEL BLUESTEIN, PRESIDENT, ENERGY AND ENVIRONMENTAL ANALYSIS, INC.

Mr. BLUESTEIN. Thank you.

I have submitted more detailed testimony but for the sake of brevity I would like to summarize the key points.

Thank you for the opportunity to testify today. My name is Joel Bluestein, President of Energy and Environmental Analysis, Inc. EEA has been providing energy and environmental consulting services since 1974. Among our major areas of expertise are analyzing and forecasting supply, demand and price of natural gas, the impacts of regulatory policy on energy markets and energy technologies. We have done this work for natural gas producers, pipelines, local distribution companies, power generators, technology

developers, the U.S. Department of Energy, the U.S. Environmental Protection Agency and other public, private and institutional clients.

The key points of my testimony are largely what you have heard already, the gas supply/demand balance has gotten tighter and will remain tight; gas prices will be higher than in recent history, perhaps significantly higher; power generation will be the major growth sector for gas demand. All of this will happen independent of any new environmental regulation of the power sector. However, multi-pollutant regulation of the power sector can be accomplished I believe without exacerbating the gas supply/demand balance and it can be designed to reduce the gas issue by encouraging development of new, clean and more efficient coal and gas technologies through gradual implementation and allocation of allowances to new plants.

There is a figure at the beginning of my testimony which summarizes our most recent 20 year forecast of North American natural gas prices and it shows that we expect gas prices at the Henry Hub to average about $5.70 per million btu for the next 2 years and decline to a level around $4.50 per million btu in constant dollars for the remainder of the forecast. This is substantially higher than historical prices as you have heard.

The roots of this change reflect the tighter balance of supply and demand for natural gas resulting in higher prices and increased volatility. It does not mean that we are running out of natural gas but it does mean that gas producers need to look farther afield and spend more money to meet the demand for gas and that is reflected in the price.

Our forecast involves a scenario that requires very large investments of capital, a lot of positive policy decisions such as support for Alaskan gas pipeline, development of new drilling areas, development of LNG terminals, et cetera. If these don't occur, then there is more upside potential than downside on gas prices.

The question of how we can best ensure an adequate gas supply is complex and important. It is already being discussed in other forums as mentioned earlier and it probably needs a lot more discussion. I think the question for today is how does the gas supply price and supply outlook affect environmental regulation of the power generation sector? My short answers are that multi-pollutant regulation of NOx, SO_2 and mercury should and can be accomplished without exacerbating the gas supply balance and that multi-pollutant regulation should and can be designed to allow and encourage a new generation of cleaner, more efficient coal plants that will allow continued use of coal for power generation in an environmentally sound manner.

I think the concern that air regulations will push gas demand for power generation inexorably until it threatens our economy is overstated. The EPA modeling of the Clear Skies Act and many separate mercury control scenarios does not show significance switching from coal to gas, even though it was done assuming much lower gas prices than we currently project. Under our higher projected gas prices, we would expect even less switching to gas.

While a lot of new gas generating capacity has been built recently, in certain areas, these new gas plants actually reduced gas

consumption by replacing older, less efficient gas generation. We have seen old gas powerplants retired in Texas because they cannot compete with the new, more efficient gas plants and it has been estimated that replacing all the old gas plants in Texas with new state-of-the-art gas combined cycle plants could reduce gas consumption for power generation in the State by over 200 bcf per year.

Use of even more efficient combined heat and power could make this reduction even greater and could apply in other parts of the southwest as well as parts of the west, south and north east. So new, efficient gas plants can be part of the solution.

At the same time, the higher gas prices go, the better the economics of coal look. Coal plants today with SO_2 and NOx controls are highly competitive in the market. New coal plants being built are even cleaner. New coal technologies being developed such as fluidized bed and integrated gasification combined cycle plants are cleaner and more efficient yet. This kind of new technology is vital to addressing additional pollutants such as mercury or even CO_2.

Multi-pollutant programs such as proposed here will help the development of new, clean coal technologies by providing increased regulatory certainty and flexibility to find effective compliance solutions.

One shortcoming of the Clear Skies Act in supporting new technology is that the grandfathering approach to allowance allocation disadvantages new plants in general and new coal plants in particular. The failure to allocate allowances to new coal plants creates a disincentive for companies to develop these plants and drives the power sector more toward gas.

An allocation approach that includes new plants through updating the allocation and rewards efficiency is one way to help ensure that we can continue to rely on our substantial coal resources. Phased implementation of emission caps is also important for the development of new technology. Command and control programs and cap and trade programs with large reduction steps don't provide enough time for technology development. On the other hand, delaying the imposition of the regulation doesn't provide a sufficient driver for technology development. A series of more gradual steps can jump start technology development, keep it moving and avoid economic disruption.

I believe that an appropriately designed, gradual cap and trade approach could even be used to address CO_2 reductions by promoting a long term, balanced mix of gas renewables, advanced coal technology such as IGCC with sequestration, combined heat and power and other efficiency measures. This is illustrated in my testimony with an approach in which the emission caps actually increases for the first several years and then levels off and begins a very gradual decline to an end point in 2060.

In conclusion, we do see higher gas prices in the future regardless of what regulations are imposed on the power generation sector. This increase and its implications need to be addressed separately from the effect of multi-pollutant regulations. Higher gas prices will increase the value of new, clean, efficient coal technologies and multi-pollutant legislation can encourage the development of these technologies and limit reliance on gas by providing

allowance allocations for new, clean coal and efficient gas technologies through updating and by setting gradually declining emission caps from an early starting point.

Thank you again for this opportunity to speak.

Senator VOINOVICH. Thank you, Mr. Bluestein.

We will start a series of questions. I will try and limit mine to 5 minutes. Then I will give Senator Carper a chance and keep going back and forth.

Mr. Krimmel, you mentioned it is essential that American manufacturers have access to affordable, reliable energy in order to compete in the global marketplace. I noticed in your testimony that you really are concerned about this.

Could you share with us your experiences in that global marketplace and how it has impacted your business and as chairman of the Ohio Manufacturers Association, how it has impacted some of your other associates in that organization?

The thing I remember most from your testimony when we had the listening session in Cleveland was that but for your energy costs, you had a profitable year and because of the spike in the cost, you lost money. I have commented I think the beginning of the recession in Ohio started with the spiking of gas prices during that period of time which sent a real chill through the manufacturing sector.

Mr. KRIMMEL. Yes, I certainly agree. In fact, when I arrived in Washington today I saw a graph of manufacturing jobs in Ohio and while my testimony indicates there are over 1 million direct manufacturing jobs in Ohio, I am sad to say it has crossed below a million just recently. The graph really begins dropping precipitously in 2001 the number of manufacturing jobs in Ohio. If you do the inverse of that and track natural gas, that is when the natural gas became very high priced and volatile. I think it was a major contributor to the loss of these jobs.

I can't emphasize enough that there are certain things I can do better than my European competitors, better than my Asian competitors. I am not afraid of paying my people $20 a hour while the Asians are paying $20 a week because my workers are much more productive than their workers and I am investing in productivity improvement. That is an important asset. I can offset that.

I cannot offset the natural gas difference and I wasn't certain before I came here today what the difference in price of natural gas in Asia and here was but I heard earlier testimony that indicated our prices here are nearly double what they are, what my competitors in Asia are paying.

My strategy to reverse the trend of declining sales which I showed in the one chart and we started to turn around in 1997 was through increased exports, mainly to Latin America. We currently export about 17 percent of our materials to Latin America. Prior to that time, it was just a declining domestic market that was affecting my sales.

My ability to continue to grow that export market was severely affected by the run-up in natural gas, I just couldn't compete with the materials coming over from Asia and Europe in Latin America. So it has had that type of impact. It is life threatening to a company like Zaclon and I have heard Henry Hub prices of $5.70. You

have to understand that translated into delivered prices to a company like Zaclon of about $7.50 and that is exactly twice what it has historically been.

How can I offset that? I am not certain how I can offset that. I will do everything I can but I don't know.

Senator VOINOVICH. Have you heard the same complaints or do you have any statistics on the price of natural gas on the other manufacturers?

Mr. KRIMMEL. I certainly have heard the same complaints. Natural gas is a major cost factor for all manufacturers in Ohio, not only the chemical manufacturers but yes.

Senator VOINOVICH. Does the Manufacturers Association maintain any kind of statistical analyses on its impact?

Mr. KRIMMEL. I don't think we have done an in-depth analysis of the impact of natural gas prices on the loss of jobs in Ohio. I am not certain. I will check into it and if there is, I can provide that.

Senator VOINOVICH. It would be interesting to me. I would be interested in having a survey of your membership to get an on-the-street appraisal of what impact it has had on their businesses, not only in this country but also in the global marketplace in terms of international competition and what indication they have of the costs their competitors are having to pay for natural gas.

Mr. KRIMMEL. I will see, Senator, whether we have anything first, I don't think so, and if not, I will see what we can initiate and get information to you.

Senator VOINOVICH. Thank you.

Senator Carper?

Senator CARPER. Mr. Thumb, I think I understood you to say earlier in your testimony that electric generators have no other alternative than switching to natural gas to meet CO_2 limits. I am wondering if there are maybe some other alternatives than just that one. Among the alternatives are becoming more efficient and one of those opportunities might be through co-generation, another could be coal gasification.

Yesterday, I went for a drive in Washington. I don't normally do that, I normally jump on a train and come down here and go home every night to Delaware. I drove a car and I saw Senator Voinovich doing the same thing. I don't often see him driving around Washington.

Senator VOINOVICH. Because I don't have a car here.

Senator CARPER. The folks from GM were good enough to loan us both a car for a few minutes and we went for a short drive. The cars we drove were powered by hydrogen and used fuel cells and there is a fair amount of interest and focus on fuel cell technology, mobile fuel cell technology in our cars, trucks and vans as we look toward to having those on the road in some numbers by the end of this decade.

Not as much attention has been given to the use of fuel cells as a stationary source of power within the manufacturing business or it could be in a home and the ability for us to generate the electricity we need through fuel cells and even sell electricity onto the grid.

Did I hear you correctly when you said that, Mr. Thumb?

Mr. THUMB. If I said that, I spoke incorrectly. I thought I said primarily natural gas was the alternative. In my written testimony, I did try to make that point that substantially a change will have to come and then went through the other potential fuels, the possibility of increasing hydro, the possibility of our getting new and I went into the renewables potential and tried to point out those. I do think the one footnote tries to clarify that. My apologies, I thought I said primarily.

It is a big shift. Every time we model it a huge percentage of that shift goes to natural gas and hopefully I used the word primarily.

I was interested in your point on fuel cells. If you would allow me, natural gas is a big contributor if you are going to fuel cell technology. I think only 5 percent of hydrogen comes from natural sources and then you have to get it from others and natural gas is one of the big ones to generate that kind of hydrogen.

Again, I am deeply concerned about the supply sector and that is the only thing I came to testify to you about.

Senator CARPER. I don't know if any of our witnesses are up to speed on clean coal technology and what you see waiting in the wings or what has been developed at the R&D level, pilot technology level. Are any of you able to share with us some up to date reports with respect to clean coal technology, particularly as it pertains to levels of emissions we are able to achieve? Mr. Bluestein?

Mr. BLUESTEIN. I can give a small report. I think we are all aware of integrated gasification combined cycle technology which is certainly not the newest technology. As mentioned earlier, criteria pollutant levels comparable to natural gas combined cycles and also offers the opportunity for lower cost method of removing CO_2 which could be sequestered. Deputy Secretary McSlarrow mentioned the zero generation coal technology being pursued. There is a new plant in Pennsylvania, a company called WMPI that is going to be used coal waste that has been left around for many years to generate electricity and steam and clean diesel fuel and potentially could be shifted to generate hydrogen from coal.

I think if we are looking at controlling CO_2, clearly the answer in the long term is that we have to be able to use these clean coal technologies and generate electricity with sequestration or generate hydrogen. Mr. Thumb is correct, right now most hydrogen comes from natural gas. In the long term, it could come from coal and that technology is known. It is an issue of making it less expensive.

I think the key issue here is how does multi-pollutant regulation facilitate that change. How is the legislation written to encourage that technology conversion? I think for example the Carper-Chafee-Gregg bill makes some good steps in that direction. There are also aspects of Clear Skies that help that.

Senator CARPER. In the second round, I want to come back to that point with you, Mr. Bluestein, and with others on the panel. I would like to discuss what do we need to be doing legislatively in order to encourage the investment in those kinds of technology, not just by the Government, not just by the Federal Government, but what do we need to do to encourage investment in those kinds of technologies by the utilities and by those who invest in utility companies?

Mr. THUMB. Senator, on your question, you said any of us. I am not an expert in those clean coal technologies but if you would allow, one of my colleagues with whom I work closely is here and could provide additional response if you choose. He happens to be sitting in the first row. That is up to you if you would like to hear his response.

Senator CARPER. That is fine with me. Would you identify yourself for the record?

Mr. HEWSON. My name is Tom Hewson.

I would just like to reiterate what Mr. Bluestein said as well, that obviously we have been making a large investment in doing research, in trying to improve clean coal technologies. We are trying to push the limits and get more and improved technologies. IGCC, which I think you mentioned, is one of the technologies in which we are spending a lot of time and effort and has the potential to reduce or improve the fuel efficiency of coal fired generation significantly above more conventional technologies today.

We are still pursuing, we still have a ways to go before we make them competitive with existing conventional technologies.

Senator CARPER. Thank you.

Mr. THUMB. You specifically mentioned co-gen and I just wanted to let you know in all the analysis we have done, including the analysis that I tried to summarize for you today does include 25,000 megawatts of co-gen which the industry is planning to do, so we already have that in our numbers. Even with that, we still see this problem for the supply sector.

I would encourage you that the timelines are what concerns the gas supply sector the most, to the extent those timelines can be extended even slightly to allow more time to come in so things other than natural gas that would help the sector. We have a real problem.

Senator VOINOVICH. Are you familiar with the comparison of our natural gas prices with those overseas?

Mr. THUMB. Probably cannot do those off the top of my head. To do what comes out of Zeiberg and Germany and those in Asia, those are well published and I would have to go back and look them up. I cannote to you that we have done research in this battle between naptha and oil for ethylene which we used to have an advantage in the 1990's and 1980's has switched and the latest numbers I have is we have now gone to a 23 percent switch. We were 23 percent less competitive than we were before because of the change in the naptha/oil/gas. That is just on the ethylene crackers. Then you have to go through the whole chain to figure out the rest.

The chemical industry is hurting and I tried to put some of that in my testimony about this fundamental shift between the competition between Europe and Asia, particularly Asia. We were at one time the world's largest exporter of chemicals and it doesn't look like that past is going to happen. Asia and Europe are definitely going to intrude upon that with this fundamental shift in the raw material feedstock.

Senator VOINOVICH. That is the same type of information I have gotten from some people who have stopped by to see me. Does anyone know why is it that their prices are so much lower than ours?

Mr. METZ. My scope is a lot smaller than Oklahoma versus the world but I would say they are closer to the sources and they have been importing LNG and the pipelines have been built from the former Soviet Union and that kind of thing, those things are in place and those supplies. In the world we have more gas than we consume. It is just trying to get it to the customer.

Senator VOINOVICH. Mr. Thumb, do you have any comment on that?

Mr. THUMB. I was trying to do the specifics. I don't think I can recall from memory the specifics but the fundamental situation particularly in Europe is you do have the supplies, you do have supplies coming in from several different sources and that has been able to hold it.

We don't have the multitude of supply options they do and plus we are a very mature region. We are going to have to build those and we talked about some of these projects, LNG and the Arctic gas supplies that will come in hopefully in time.

They do have the Russian, they do have the Norwegian gas, the UK gas as well as that which is on shore that has helped them. Asia, I can't do off the top of my head because it is very much broken into pieces. It is such a huge area, I would have to do research for you.

Senator VOINOVICH. Any information you would like to submit after this hearing, I would like to see. I think too often when we look at some of our things, we just think of the United States and whether we like to admit it or not, we are in the global marketplace. It is impacting our standard of living and it gets back to how do you balance your environmental concerns with your economic concerns.

As Senator Carper mentioned, we will have the energy bill on the floor for discussion and the issue is, are there areas we should be looking at that would be reasonably productive in terms of natural gas, the whole issue of bringing the gas line down from Alaska. That is not something around the corner but we certainly have to look at those issues. Then you have to look at the issue of this balance between went does a utility or someone who has to make a decision decide to switch to natural gas from something they are now doing.

Mr. Bluestein your comment was if we put more pressure on people that you would see more use of clean coal technology. How fast do you do that over a period of time. I keep hearing that if you have these caps that are unrealistic or realistic but don't give people enough time to comply with it, the only choice someone has is to switch to natural gas.

I guess my point is that I keep hearing from our people in Ohio, with the uncertainty we have out there today, and we both agree on uncertainty, the only thing I am looking for is any new facilities are going to use natural gas. Do you want to comment on that?

Mr. BLUESTEIN. Yes, I think you touched on several key points. To take the last, we have heard a variety of situations directly and indirectly from large power generating companies that with uncertainty over CO_2 regulation, they are not willing to take a risk. That suggests to me that they need to get some certainty through some legislative action.

At the same time, I agree with you and others here that unless something on CO_2 or any other pollutant is done cautiously it can have grave consequences for the economy. I don't know if you had a chance to look at the second chart in my testimony but I think the key is timing, as in many things. On the one hand, there are these new technologies and people will agree that they are not quite ready today, the costs are a little too high and we need to work on them more.

On the other hand, the key driver for those technologies is regulation. If we delay the regulation for 10 years, most likely we will find ourselves at exactly the same point again. If you look at the conventional cap and trade program, it is kind of like a cliff. There is an emission level, you come along to some point and everybody jumps off the cliff. That is a little scary for people.

The alternative I think is to build a staircase. If we replace that cliff by a stair step of gradual reductions, it doesn't mean that the bottom has to be any further away in terms of the timeline but phase in things gradually, then what you do is give people the certainty of where they are going, give those people certainty that they need to go somewhere.

Our history has been that U.S. industry has been very effective at finding ways to meet environmental regulations given a decent warning. If we could phase it in gradually, then I think that would jumpstart these technologies but with no timing, I agree, it can be very difficult and probably have dire circumstances, particularly for CO_2. I think it can be done with the proper program design.

Senator VOINOVICH. Mr. Metz, you said we have had a tough winter and by this time, we should be building reserves for the next one. What is your prediction? If we do have a very hot summer, what impact do you think that is going to have relative to the prices we have experienced this last winter?

Mr. METZ. Today the price for this time of year are higher than they have ever been. With a very hot summer, the people who have to fill the storage to keep the residential people warm next winter don't know what next winter is going to be like, so they have to get to the historic levels. So they become a buyer of gas out there like the manufacturer is trying to do. When there are more buyers than sellers, the price is going to increase. I don't think it will be quite as dramatic if it was 20 below zero on a day but those people have a lot of pressure to get back to those 3.1 trillion cubic feet of gas in storage by the end of October. That puts more and more pressure on the marketplace.

Senator VOINOVICH. There is no way that the supply can compensate at all for that?

Mr. METZ. No, I don't. To me the price, when it was at high levels in the year 2001, there wasn't this massive amount of new gas supply that came to the marketplace under those price scenarios. It was a little growth and trying to maintain which is very hard. As Mr. Thumb said, the places to drill in the U.S. are very mature, so there is not a lot of big reservoirs waiting to happen. The biggest reservoir you can think of is the North Slope and that is a long term process to get that gas down to the U.S.

Senator VOINOVICH. Some say that don't worry about it, we will have liquefied natural gas. That isn't cheap, is it?

Mr. METZ. If the current price, the things I have read, is $3 plus for gas on a long term basis can make those more viable, but the current level of imports of LNG is 1.2 percent of the total consumption we have. They are talking about increasing that 15 fold over the next 10 or 12 years. That is a major increase. I keep seeing people who want to site an LNG import facility have problems getting that done. I think that is a very strong goal to try to reach, so I am not sure it is going to be as significant in the timeframe people are predicting.

Senator VOINOVICH. It is relatively expensive?

Mr. METZ. It is expensive to a degree. When LNG first started, the people who had it were the Algerians and that kind of thing and they wanted to price it at a much higher price, so all that business fell apart. A lot of those were mothballed and not used.

I think now the biggest supplier of LNG is Trinidad, so that is much closer to the U.S. and there has been a lot of rethinking of how it should be priced. So it is more viable today I believe but it still has a cost. You can't instantly have enough ships to haul it in because they take special ships to do that. You have to have unloading facilities and regasifying facilities and you have to get past the permitting to be able to do that.

Even though it is out there, gas in the world is greater than we consume, it is just not easy to move across the ocean.

Senator VOINOVICH. It would be interesting to measure. We have an economic stimulus bill we are considering now and I have discussed that with a lot of people in my State and they have said to me if you could do something about the natural gas prices, it would have more effect on my business than any stimulus package you could pass here in Washington.

We have an economy that is pretty fragile right now. It seems to me that we have to start looking at some of these other costs that we have that are bringing us down. For example, I have been hearing more and more complaints from manufacturers about competition from China. People are complaining about litigation costs and some of the other things out there impacting on our economy.

I think so often we just don't face up to some of the real problems we have. It would be wonderful if somehow we could compromise to get people in a room and work out some of these issues that have been around for a long time and we don't address them. I don't think we are making great progress in improving the quality of the environment, nor are we doing very much in terms of providing reasonable energy for our businesses and our people and our country.

Senator Carper?

Senator CARPER. Mr. Krimmel, I meant to as you this question earlier but it slipped my mind. How long have you lived in or around Cleveland?

Mr. KRIMMEL. Fifty-six years. I am from Cleveland, went to school in Cleveland and started my business in Cleveland.

Senator CARPER. I presume you have seen a number of mayors of Cleveland come and go over that time?

Mr. KRIMMEL. I have, yes.

Senator CARPER. Were there any you thought did an especially good job?

Mr. KRIMMEL. As I recall, the real turnaround in Cleveland came under Senator Voinovich. I have to give him some credit for that.

Senator CARPER. I have heard that from many people. Every time they visit the Rock and Roll Hall of Fame, they come back singing his tune.

On a more serious note, Mr. Bluestein, you talked a bit about steps versus cliffs and said our experience as a Nation is when we put in place environmental regulations and give reasonable amounts of time for compliance, then usually with Yankee ingenuity and a lot of hard work and some good investment, our companies and businesses can get there and stay in business and remain profitable and do the right thing for the environment.

We have introduced the legislation I have referred to a couple of times along with Senator Chafee and Senator Gregg. When you characterize the approach we have taken with respect to CO_2, we don't mandate. I think in Senator Jeffords' bill he mandates getting back to 1990 emission levels I think within this decade. In our legislation, we say by 2009, CO_2 emissions have to be where they were in 2005. By the year 2013, we call for ratcheting down CO_2 emissions where they were in 2001. Is that a cliff or is that a staircase approach?

Mr. BLUESTEIN. I think the key issue in that legislation is that you also allow off-sector reductions. I think in doing any kind of CO_2 mitigation, there are two safety valves. One is off-sector reductions which you incorporate; the other would be timing which is the example I gave.

I agree there is a huge amount of uncertainty about how we reach long term CO_2 targets. It is critical that we promote long term solutions like new coal technology, sequestration, other things we probably haven't thought of yet. I think if there were no off-sector reductions allowed in the legislation you've offered, I would be concerned. I think with the off-sector reductions, it offers a safety valve.

The concern I would have is does it at the same time provide the push for the new coal technologies? That is what you really need to move forward.

On the other hand, you do have an allocation program that is more favorable to new technologies including coal technologies. So that is a bonus for going down that longer term path.

Senator CARPER. Someone told me the other day that if you consider the amount of coal reserves we have in this country and compare those to the amount of oil reserves they have in Saudi Arabia or Iraq, we are the Saudi Arabia of coal and we have more coal reserves maybe than any country in the world. Can one of you confirm that for me?

Mr. HEWSON. The other two are Russia and China and I do think we are No. 1 ahead of those. We are uniquely in our carbon fuels gifted with coal. Saudi Arabia and Iraq are gifted with oil and gas.

Senator CARPER. And North Dakota is gifted with wind and lignite.

Mr. Chairman, it seems to me and it is kind of fortuitous that as we hold this hearing, we are literally taking up the debate on the energy bill almost at the same time. There are so many things we can do in the context of energy legislation. Part of that deals

with renewable forms of energy, whether hydro or geothermal, solar or even biomass. The Dupont Company has come up with new technology that enables them to take the entire cornstalk and turn that into ethanol and to do so in a way that is so energy efficient they believe we will no longer need a tax subsidy to be able to compete with gasoline.

Down in Brazil, they are doing a similar kind of thing with sugar cane which is exciting and encouraging.

We talked earlier about natural gas production, being able to complete a pipeline from Alaska to get some of that natural gas to us and I think there is going to be a proposal to do a study to look offshore to see if there are some places that it makes sense to search for natural gas.

I am a former Navy guy and I believe nuclear power has an appropriate role in providing some of our energy needs. I believe legislation coming to us supports expansion of nuclear power. We talked a bit about fuel cells. We have not talked too much about conservation. I think one of the damning things I have heard about the bill coming out of committee to us in the Senate on the conservation side is it just doesn't do that much. They focus a good deal on the production side but not very much on the conservation side, and little if anything on more efficient cars, trucks and vans, little if anything with respect to the air conditioners we will be using this summer and how to use a lot less electricity from more efficient air conditioning.

I keep coming back to the matter of what can we do to incentivize the investment in clean coal technology, not just the R&D, but to encourage utilities and investors to put their money where their mouths are. We know we have the technology, we know it works. I think part of the challenge for us is how do we craft legislation where there is a 3-P or hopefully a 4-P bill that incentivizes the investment in that kind of technology.

Mr. Bluestein talked a bit to that and I don't know if you have anything else you want to add but for me that is not the whole ball game, but it is a big part of it.

Senator VOINOVICH. Senator Carper, I can tell you, and I am not here to push Clear Skies, but I have it authoritatively from the utilities in our State and other utilities that if Clear Skies passed, they would move forward with clean coal technology, that the caps in that and the certainty of that would cause them to move forward with clean coal technology so we could burn our coal and also the advantage of developing clean coal technology is that you can either sell it or give it away to other places in the world because we know darned well that China and Russia have large supplies of coal. We know they are going to be burning that, either clean or burning and emitting into the environment and ultimately impact us environmentally and directly or indirectly in terms of our economy because of competing in the global marketplace.

Senator CARPER. Mr. Bluestein, I think I understood you to say in your testimony, talking about the effect of Clear Skies legislation on clean coal and willingness of investors to invest in clean coal facilities, that there would be some positive effect that would come from Clear Skies. Did you say that and could you compare the positive effect on the adoption of clean coal technology in a practical

world from Clear Skies with the effect that might come out of legislation Senator Chafee, Senator Gregg and I have introduced?

Mr. BLUESTEIN. There is definitely a positive effect from either bill through providing certainty and flexibility. The cap and trade program provides a huge amount of flexibility to affected sources to try different technologies, have flexibility in compliance. Both of the bills, the one Senators Carper, Gregg and Chafee have introduced and Clear Skies provide flexibility and that is important for existing and new plants.

The other way such a bill can affect future construction I think the biggest piece is through the allocation of allowances. There is something like $9 billion worth of allowances that are going to be distributed under this kind of system, $9 billion per year of allowances. That can have a big effect on choices that companies make.

In the Clear Skies Act, all of those allowances go to old plants. Some people see that as a benefit for coal. It is not really, it is a benefit for existing plants. A lot happen to be coal plants but in terms of coal with a "C" the ability to develop new technologies, the ability to have coal as a continuing important part of our energy mix, we have to look to the future and that is why I think a system where allowances are periodically reallocated to all the plants including new plants provides an incentive to develop and build new coal plants and develop new coal technologies that are part of the mix I think we all agree we need.

So I think that is the second piece that is very important and which is in the bill that Senators Carper, Chafee and Gregg have introduced.

Senator CARPER. I think that this has been a good hearing. I presume this is the last panel?

Senator VOINOVICH. Yes, it is.

Senator CARPER. I would note one of our witnesses, I am not sure who, actually mentioned we can improve our efficiency in generating electricity by introducing more energy efficient coal-fired plants, by introducing more energy efficient nuclear plants. Someone also mentioned that we can save ourselves some natural gas by introducing the next generation of natural gas powered electric utilities. That is true too. Some of these plants are pretty old, aren't they, and rather inefficient?

Mr. BLUESTEIN. Yes, and to the extent that new gas generation replaces less efficient gas generation, it is reducing gas consumption.

You mentioned efficiency. We can also allocate allowances to electric efficiency improvements so we can use that mechanism because it is a zero sum game. It is electricity that you generate or you don't and somehow it relates to the emissions you create or don't create. If we are going to have a market-based system, which is what the cap and trade program is, we ought to include all of the market and allow that market to function. The idea is the market is going to find the least cost way of meeting our emission goals, so we have to include everybody.

I think the topic of efficiency has been mentioned several times and that includes end use efficiency. There are ways we can include that in the program and reap those benefits as well.

Senator CARPER. Good point. Thank you.

Mr. THUMB. IF I could add to the question, you are right, when we do build combined cycle plants, they do displace steam generator plants. Basically, it takes about seven molecules in a combined cycle plant to produce the same amount of electricity as it takes 10 molecules inside a steam generator, the so-called efficiency effect. That efficiency effect because of the way this Nation evolved is highly concentrated in three areas, Texas, Florida and California.

We are basically building between 1998 and about 2007, 266,000 megawatts of new capacity of which about 70 percent of these new combined cycles, 184,000 megawatts. There is only 125,000 megawatts of existing steam generator and except for the three units I note, we really aren't getting that efficiency effect. This is new gas, not that it isn't great, but I wanted to add it tends to be very regional specific because of the way this Nation evolved. It is never homogeneous.

Those plants, basically those 60 percent plants beyond what we have right now, are located in other regions and that will be incremental gas demand.

Senator CARPER. It's been a good panel and a very good hearing. We are grateful to each of you for being here and sharing your thoughts and responding to our questions.

Senator VOINOVICH. Thank you very much.

We stand adjourned.

[Whereupon, at 11:55 a.m., the subcommittee was adjourned, to reconvene at the call of the chair.]

[Additional statements submitted for the record follow:]

STATEMENT OF THE HONORABLE KYLE E. MCSLARROW, DEPUTY SECRETARY OF ENERGY

Mr. Chairman, I am pleased to appear before you today to discuss the Administration's National Energy Policy and to discuss why we think Clear Skies is a critical component of the President's strategy to confront our energy and environmental challenges.

Though it is often overlooked, the President's National Energy Policy directed the Administrator of the Environmental Protection Agency to work with Congress to propose legislation that would establish a flexible, market-based program to significantly reduce and cap emissions of sulfur dioxide, nitrogen oxide, and mercury from electric power generators. The President's National Energy Policy concluded that, as our energy needs grow, additional innovations would be necessary to continue improving our environmental conditions. The success of the Clean Air Act Acid Rain program in promoting innovation and emission reductions is well known especially by Members of this committee—and served as the template for the Clear Skies legislation now before this Committee.

We are pleased that the Senate is now considering a comprehensive energy bill reported out of the Senate Energy committee, and commend Chairman Domenici and the members of his committee for acting so swiftly. And, we commend you, Mr. Chairman, and this committee for moving aggressively to consider the Clear Skies legislation.

Introduction and Outlook

Over the past century, we have witnessed the power of energy to drive global economic development. In the 1970's, we learned firsthand how energy shortages and resulting high prices can compromise economic growth and the quality of life to which Americans have grown accustomed. Clearly, the availability of reliable, affordable energy is critical to sustained economic growth.

We have a series of long-term energy challenges that require action now. These challenges are present along the entire energy continuum, affecting crude oil, refinery products, natural gas, electricity generation and transmission, the environment, and economic growth.

The Nation's Power Industry

To understand the need for Clear Skies, it is important to understand the current make-up of the Nation's electric power industry. The U.S. power-generating sector remains the envy of the world. On any given day, approximately 5,000 generating plants can make available up to 900,000 megawatts of electricity for virtually every home and business in the country. Fossil fuels supply about 70 percent of the Nation's requirements for electricity generation. Coal, alone, accounts for more than 50 percent of the electricity Americans consume. Primarily because of the power sector's use of abundant supplies of American coal and natural gas, consumers in the United States benefit from some of the lowest cost electricity of any free market economy.

U.S. Electricity Generation by Fuel

America's economic progress and global competitiveness have benefited greatly from this low cost electricity. Electricity is an essential part of America's modern economy. While the Nation has made dramatic progress in "decoupling" overall energy consumption from economic growth, increased economic activity remains closely linked to the availability of affordable electric power and is likely to remain so well into the future.

The Nation's demand for electricity is projected to grow significantly over the next 22 years. Between now and 2025, the United States will likely have to add between 446,000 and 656,000 megawatts of new generating capacity to meet growing demand. This is equivalent to adding the entire power generation sectors of Germany and Japan, combined, to the U.S. power grid. Concurrent with this dramatic and capital intensive expansion of the Nation's power fleet, power generators will also be called upon to make new investments in pollution control technologies to meet tightening environmental standards. Over the past 25 years, America's electricity utility industry has invested billions of dollars in advanced technologies to improve the quality of our air. Each year, a substantial portion of normal plant operations costs again amounting to several billions of dollars a year are associated with operating installed technologies that reduce air emissions.

The investment has returned dividends. By installing new technologies to capture tiny particles of fly ash, the power industry has significantly improved air quality by dramatically reducing particulate matter. The power industry has also installed sulfur dioxide controls on more than 90,000 megawatts of capacity as part of a successful effort that has cut SO_2 emissions substantially since 1970. Most of the nation's coal-fired plants have also installed nitrogen oxide controls that have helped make initial NOx reductions. In short, advanced technology given the time to mature and be deployed can be effective.

Technological improvements have permitted the Nation's power sector to continue generating relatively low cost power and, at the same time, use the energy resources America has in most abundance. America's use of coal, for example, has actually tripled since 1970 even as our air has become cleaner. Advanced technology also offers a pathway toward the prospects of achieving even greater reductions in air pollutants in the future.

At this point, let me review long-term energy trends with a focus on natural gas and coal which should help illustrate our challenges. My comments here are based on analyses prepared by the Department of Energy's independent analytical arm, the Energy Information Administration, in its Annual Energy Outlook 2003 (AEO 2003). All statistics are based on EIA's reference case scenario for the year 2025, which assumes current laws and regulations, including the Eastern U.S ozone SIP call, but not future regulations, such as those to implement the new Clean Air Act ozone and particulate matter standards or the mercury MACT standard.

The reference case also assumes continued improvement in energy consuming and producing technologies, consistent with historic trends.

Natural Gas Trends

The natural gas share of electricity generation is projected to increase from 17 percent in 2001 to 30 percent in 2025. By 2025, total natural gas consumption is expected to increase to almost 35 trillion cubic feet, which will amount to 26 percent of U.S. delivered energy consumption. Industrial consumption the largest natural gas-consuming sector—is expected to increase by 3.4 trillion cubic feet over the forecast, driven primarily by economic growth. Combined consumption in the residential and commercial sectors is projected to increase by 2.6 trillion cubic feet between 2001 and 2025, driven by increasing population and healthy economic growth, and accompanied by gradually rising prices in real terms. Natural gas remains the overwhelming choice for home heating throughout the forecast period. Natural gas con-

sumption in the generation sector doubles by 2025 due to lower capital costs, higher efficiencies, lower construction lead times, and lower emissions.

In the short term, domestic natural gas prices are expected to remain high in 2003 and are at risk for significant volatility through at least the next 12 to 18 months. EIA estimates that the current natural gas storage level is the lowest on record for this point in the annual cycle. As long as temperatures remain at or below normal this summer, natural gas storage levels should rise sharply over the coming months. But if this summer is hotter than normal, natural gas prices would jump as cooling demand would compete with the need to build storage inventories. A large rebound in the economy, poor results from the ongoing increase in natural gas drilling, or a continued tight oil market might also spur volatility.

On that note, drilling for natural gas expected to increase substantially, but a fourth U.S. LNG terminal is expected to open this year at Cove Point, Maryland, and a Kern River Pipeline extension from the Rockies to the West Coast opened earlier this month—greatly increasing the capacity to move gas from a key producing area. In

In 2004, declining oil prices should ease natural gas prices, and strong natural gas drilling should increase productive capacity through the end of the year.

Domestic gas production is expected to increase more slowly than consumption over the long-term forecast, rising from 19.4 trillion cubic feet in 2001 to 26.8 trillion cubic feet in 2025. The national average wellhead price is projected to reach $3.90 per thousand cubic feet, in 2001 dollars, by 2025.

Increased U.S. natural gas production through 2025 is projected to come primarily from unconventional sources and from Alaska. Unconventional gas production increases by 4.1 trillion cubic feet over the forecast period—more than any other source, largely because of expanded tight sandstone gas production in the Rocky Mountain region. Annual production from unconventional sources is expected to account for 36 percent of production in 2025, compared to 28 percent today. An Alaska natural gas pipeline is projected to begin flowing gas to the lower 48 States in 2021, reaching 4.5 billion cubic feet per day in 2023, with further expansion beginning in 2025. In 2025, total Alaskan gas production is projected to be 2.6 trillion cubic feet.

Conventional onshore non-associated production is projected to increase by 1.2 trillion cubic feet over the forecast, driven by technological improvements and rising natural gas prices. However, its share of total production declines from 34 percent in 2001 to 29 percent by 2025. Non-associated offshore production adds 560 billion cubic feet, with increased drilling activity in deep waters; however, its share of total U.S. production declines from 22 percent in 2001 to 18 percent by 2025. Associated dissolved production declines by 800 billion cubic feet, consistent with a projected decline in crude oil production. Lower 48 associated-dissolved natural gas is projected to account for 8 percent of U.S. natural gas production in 2025, compared with 15 percent in 2001.

A key question facing producers and policymakers today is whether natural gas resources in the mature onshore lower 48 States have been exploited to a point at which lower discoveries per well eliminate the possibility of increasing—or even maintaining—current production levels at reasonable cost. Depletion has been counterbalanced historically by improvements in technology that have allowed gas resources to be discovered more efficiently and developed less expensively, have extended the economic life of existing fields, and have allowed natural gas to be produced from resources that previously were too costly to develop. In EIA's projection, technological progress for both conventional and unconventional recovery is expected to continue to enhance exploration and reduce costs. However, there is a significant debate within the industry itself as to whether this will occur.

The difference between U.S. natural gas production and consumption is net imports. Net imports of natural gas, primarily from Canada, are projected to increase from 3.6 trillion cubic feet in 2001 to 7.8 trillion cubic feet in 2025. Net imports contributed 16 percent to total natural gas supply in 2001, compared to an expected 22 percent in 2025. Almost half of the increase in U.S. imports is expected to come from liquefied natural gas (LNG). By 2025, EIA expects expansion at the four existing terminals and construction of three new LNG terminals.

Growth in pipeline imports from Canada partly depends on the completion of the MacKenzie Delta pipeline, which is expected to be completed in 2016 and expanded in 2023. Net imports from Canada are projected to provide 15 percent of total U.S. supply in 2025, about the same as in 2001. Mexico is projected to go from a net importer of U.S. natural gas to a net exporter in 2020, as an LNG facility begins operating in Baja California, Mexico, in 2019, predominantly serving the California market. By 2025, the United States is expected to import about 350 billion cubic feet of natural gas from Mexico per year.

Coal Trends

The share of electricity generated from coal is projected to decline from 52 percent in 2001 to 47 percent in 2025 as a more competitive electricity industry invests in less capital-intensive and more efficient natural gas generation technologies. Nonetheless, coal remains the primary fuel for electricity generation through 2025, and EIA projects that 74 gigawatts of new coal-fired generating capacity will be constructed between 2001 and 2025.

EIA's analysis here does not incorporate a projection of several Clean Air Act programs that could have a significant impact on the use of coal such as the mercury MACT. Although this rule has not been proposed, based on requirements of the Clean Air Act it is designed to require the control of mercury on a source by source basis by the end of 2007, which could be very costly and cause an even greater decline in the share of electricity generated by coal.

EIA projects growing domestic consumption over the forecast horizon, and projects a simultaneous reduction in real coal prices to generators by approximately 12 percent by 2025. Average annual coal consumption is projected to increase by 1.3 percent per year between 2001 and 2025. As domestic coal demand grows, U.S. coal production is projected to increase at an average rate of 1.0 percent per year.

The decline in prices is driven by the expectation of continued improvements in labor productivity, and the continued market expansion of western coal, which has a lower minemouth price than eastern coals. As western production makes further inroads into markets traditionally supplied by eastern coal, the average heat content of the coals produced and consumed will drop as well, reflecting the lower thermal content per ton of western than eastern coals.

President Bush's National Energy Policy

We long ago ceased to fully provide for our petroleum needs domestically, and though most of our current natural gas demand can be met with North American production, the trend here is also toward a greater share for imported natural gas. And coal, our most abundant energy resource, is actually projected to reduce its percentage share of electricity generation.

We are often at the mercy of events and decisions over which we have often limited and sometimes no control. When winters and summers are mild; when all refineries or pipelines are online; when supply from abroad is abundant and reliable; when prices are reasonable, we do not feel this dependency. However, when almost any one of these factors breaks down, markets react instantly, and we face the higher prices and volatility that have become by now an almost certain cyclical phenomenon.

These trends are a concern.

President Bush recognized that to prevent these problems from becoming a permanent, recurring feature of American life, we needed a long-term plan for energy security that would promote reliable, affordable and environmentally sound energy for the future.

President Bush's National Energy Policy, released in May, 2001, reflected a few, fundamental principles. First, we need to maintain a diversity of fuels from a multiplicity of sources. Second, we should seek opportunities for increased investment, trade, exploration and development, which are increasing every year, far beyond the traditional markets of the last 50 years. And third, we should focus on research and development on initiatives that seek long-term solutions to our energy challenges, as we have done with energy efficiency, renewables, hydrogen, fusion, and nuclear energy, as well as the recently announced zero-emission FutureGen coal project.

While these initiatives hold enormous promise for the future, we recognize the need for immediate actions to address the nation's growing energy demand. Clear Skies figures prominently on this list. I'd like to mention just a few of the actions currently underway, particularly those focused on ensuring adequate supplies of natural gas and electricity.

To increase and diversify domestic supplies of natural gas, the Administration, among other actions, has streamlined the process by which permits are granted for important energy projects, such as pipelines and refineries, and accelerated the leasing of non-restricted Federal lands where environmentally appropriate.

The Administration is encouraging new gas well investment by allowing for access to high quality resources and growth in pipeline delivery capability. We recognize that recoverable resources tend to be more difficult to develop and produce because the U.S. is a mature producing area. This increases ultimate supply costs, which requires ever increasing prices to be economically viable. A number of locations, such as portions of the Rocky Mountain area and the eastern Gulf of Mexico, are currently unavailable to exploration and development even though they are expected to contain substantial volumes of recoverable natural gas.

Interstate pipelines have been expanding delivery capacity, but additional expansions are needed to satisfy expected market growth. In 2002, 54 interstate pipeline projects were completed, adding about 12.8 billion cubic feet of capacity per day throughout the U.S., and proposals for expansions in 2003 through 2005 have been announced for a number of pipelines. The gas pipeline network has grown extensively over the past decade to meet the increasing demand for gas and to accommodate diversified gas sources. Regulatory lags in obtaining authorization for expansions of pipeline capacity are being addressed by initiatives at the Federal Energy Regulatory Commission (FERC) aimed at streamlining this approval process.

The Administration also strongly supports the construction of a commercially viable Alaska natural gas pipeline as a critical part of our energy security portfolio.

The National Energy Policy also highlighted the growing need for attention to the nation's electricity markets and infrastructure. The Administration's overarching goal is to ensure that Americans have abundant, affordable, clean and secure electricity supplies, and we strongly believe that Clear Skies is a key component of meeting this goal, as is a comprehensive energy bill that includes a sound electricity title to modernize our Nation's antiquated wholesale electricity laws.

The Administration believes that there really is only one viable policy choice: we must complete the transition to effective competition in wholesale power markets.

Well-functioning markets will, we believe, lead to lower costs for consumers and businesses. But there is more than simply the benefit of lower prices. A well-functioning market brings its own rewards. As confidence is gained that the system is reliable and capable of coping with high-demand for electricity, there will increasingly be less need for restrictive and prescriptive regulation. And that is the point when much-needed investment is likely to be attracted—investment in new technologies, and in improved generation and transmission facilities that produce additional energy and environmental benefits.

When the opposite is true when uncertainty reigns, when reliability is questioned, when prices seem detached from market forces investment vanishes.

The present uncertainty in the wholesale electricity market is not simply affected by policy choices that center on transmission assets and market designs. The uncertainty extends to the generation of electricity itself. That is why it is important to provide greater regulatory certainty about the kinds of investment choices that the generating industry will have to make over the next two decades.

We believe that the President's Clear Skies proposal does just that.

S. 485, Clear Skies Act of 2003

In 2000, 39 percent of the total energy consumed in the U.S. was for power generation. Since 1975, total U.S. energy use has grown by about 1.1 percent per year, while GDP and electricity consumption have grown by nearly 3 percent per year. We project future electricity growth to be somewhat less, below 2 percent per year, but it is clear that electricity is either the fuel of choice or fuel of necessity for many applications.

Our electric power is among the lowest in cost of any free market society. Low cost electricity is part of America's competitive edge in international markets. Cheap power translates to prosperity and available resources to overcome problems in many areas unrelated to energy but essential to our quality of life. A major reason that electricity in the U.S. is relatively inexpensive is that roughly one-half of our generation comes from coal.

S. 485, the Clear Skies Act of 2003, is a multi-pollutant, market-based cap and trade program that will reduce power plant emissions of sulfur dioxide (SO_2), nitrogen oxides (NOx) and mercury by approximately 70 percent from today's levels—and do it faster, with more certainty, and at less cost to American consumers than would current law.

Flexibility of compliance choices, maintenance of fuel diversity, and the cost savings passed on to consumers through lower electricity prices are among the benefits of the approach taken in Clear Skies, particularly when compared with other proposals that support more stringent targets, shorter compliance periods, or command and control regulatory approaches. The cap-and-trade system of emission reductions used in S. 485 should translate into reduced impacts on fuel markets in particular, coal and gas than equivalent emission reductions achieved through other approaches.

The Clear Skies Act substantially expands one of the most successful Clean Air Act programs the Acid Rain Program and reduces the need to rely on complex and less efficient programs. Power plants would be allowed to choose the pollution reduction strategy that best meets their needs (e.g., installing pollution control equipment, switching to lower sulfur or mercury coals, buying excess allowances from plants that have reduced their emissions beyond required levels). And like the Acid

Rain program, Clear Skies includes banking provisions, enabling companies to save unused allowances for future use. The result would be significant nationwide human health and environmental benefits; certainty for industry, States and citizens; energy security; and continuing low costs to consumers.

S. 485 establishes a coordinated timeline for control of major emissions that provides adequate time to attract investment funds and avoids premature retirement of working capital. The patchwork of existing and soon-to-be-implemented regulations under the Clean Air Act, coupled with the delays bred by continuous litigation over them, has created enormous uncertainty for utilities, co-ops, and municipal generators. This uncertainty has curtailed investments in technology that would reduce emissions at existing plants and prevented numerous new facilities from coming online. Clear Skies provides industry with the time needed to attract capital necessary to reduce emissions without jeopardizing energy security.

Energy Impacts of Clear Skies

It is difficult to quantify what the cost or energy impacts will be if multipollutant legislation is not enacted. The EIA "baseline" includes all future legislation and regulations that have been specified, but does not include regulations that have not yet been promulgated. We know that in the absence of S. 485, mercury regulations will be promulgated by December 2004. But we do not know what those regulations will require; that knowledge will come only after a lengthy rulemaking process. We can anticipate that additional reductions in SO_2 and NOx will be required to attain ambient air quality standards for fine particulate matter. But we do not know what those regulations will be. We can anticipate additional regulations to reduce regional haze, but again, we do not know what those regulations will require.

What we should be concerned with is this: uncertainty, delay, and litigation are not likely to produce greater environmental benefits; they instead are likely to lead to more costly solutions, and they risk affecting the energy fuel mix in ways that are unwarranted and unforeseen.

Although we have not contrasted Clear Skies to this unknown regulatory future, we have compared it to a future predicated on current control programs. Under Clear Skies, natural gas consumption, which is projected to increase from 23 to 35 trillion cubic feet of gas in our baseline projection to 2025, increases to 36 trillion cubic feet per year in 2025. However, we do not project that a significant change in natural gas supply is needed due to the implementation of Clear Skies. Wellhead natural gas prices follow the baseline pattern, after decreasing from the unusually high prices that occurred in 2001.

Clear Skies helps maintain coal as an important fuel source, thereby avoiding excessive pressure on natural gas prices. In our baseline projection, coal consumption would increase about 38 percent through 2025. Under S. 485, we project approximately a 26 percent increase.

EIA projects that electricity prices will be lower throughout the projection period than in 2001, for both the baseline scenario and under S. 485. The effect of the emission reductions is roughly a 0.3 cent per kilowatt-hour price increase above the baseline in 2025.

One of the concerns we have is in the ever-increasing reliance on natural gas for generation of electricity. As I have noted previously, this is primarily a function of efficiency and costs, but because our marginal supply of natural gas will increasingly come from imported LNG we should be concerned that we not place too much stress on natural gas supply by forcing a level of fuel switching from coal to gas that leads to higher volatility and higher prices. Natural gas supply as a low-cost and reliable source of electricity is not automatic one has only to witness the winters of 2000–2001, and 2002–2003 to see the point.

In both the near and long term, the price of a commodity like natural gas is determined by the interaction of supply and demand. However, the determinants of supply and demand in the near term can be quite different than the factors that determine prices in the long term. In the near term, factors such as weather related increases in demand, storage levels, productive capacity at the wellhead, and disruptions in supply lines can be paramount because of the difficulty of quickly increasing the number of producing wells. Long-term market conditions, however, depend more on such factors as

- the ability of markets to respond to price increases with adequate investments in new wells;
- continuing availability of alternative fuels for generation;
- a viable market for imported gas;
- the continued development of new technologies; and
- emissions reductions required under future regulation

The difference in what affects natural gas prices in the near term versus long term has important policy implications. We have to recognize that in the short run it is hard to do much about natural gas supply. From the time natural gas prices spike, the industry rule of thumb is that it takes 6–18 months for production to increase. And, unlike oil, there is currently no large international spot market in liquefied natural gas to moderate gas supply scarcity.

The elasticity of natural gas demand plays a significant role in price volatility. Because many users cannot switch to alternative fuels quickly, demand tends to be more inelastic in the short run. Inelastic demand means that small changes in demand lead to significantly higher prices than under less inelastic demand. Demand becomes less elastic as electric generators or industrial users lose their ability to switch to another fuel or as any user loses the ability to reduce consumption in response to higher prices.

It is, therefore, critically important that we maintain a balanced diversity of fuels to provide low-cost and abundant electricity. And the key to this is that we not assume that all policy objectives can simply be achieved with unlimited reliance on natural gas.

The Role of Research

One of DOE's fundamental missions is the advancement of energy-related technology. I would be remiss if I did not emphasize again that the projections I have presented today assume only a continuation of historic trends in technology evolution. We have the ability to change those trends through dramatic technology improvements. We intend to do exactly that.

The President has launched a suite of relevant technology initiatives: FreedomCAR and the Hydrogen Fuel Initiative (the hydrogen/fuel cell vehicle and infrastructure program), FutureGen (a program to develop a zero-emission coal-based power plant, coproducing low-cost hydrogen and sequestering CO_2), and fusion electric power plants. Success in these areas will dramatically change the energy, economic, and environmental future of the Nation.

The future role of coal in our energy mix may also be highly sensitive to the success we have in our program to improve Integrated Gasification Combined Cycle (IGCC) technology, an inherently clean way to produce power from coal. This technology has already been demonstrated at commercial scale, but additional support is being provided by DOE to enhance its efficiency, reduce technological risk, and drive down capital costs. In addition, as I mentioned earlier, we are also pursuing R&D targeted specifically on one of the tougher challenges in Clear Skies mercury control.

Conclusion

In conclusion, we believe that Clears Skies, which provides a range of benefits improved health, cleaner air, and economic efficiency—is the best approach to address our dual energy and environmental challenges. Clear Skies avoids the more serious economic consequences of other approaches to cleaner air and provides market-based flexibility to the energy sector. Clear Skies, combined with our many other efforts to develop new, reliable, and secure sources of energy, will deliver significant environmental protection. It will help us to achieve our national goal of abundant, affordable, and clean sources of energy by maintaining fuel diversity and by providing greater regulatory certainty.

STATEMENT OF JIM KRIMMEL, PRESIDENT, ZACLON, INC., CHAIRMAN OF THE BOARD, OHIO MANUFACTURERS' ASSOCIATION

Chairman Voinovich and members of the Senate Subcommittee on Clean Air, Climate Change, and Nuclear Safety, good morning and thank you for the opportunity to testify today.

My name is Jim Krimmel and I am President of Zaclon, Incorporated.

My company, which is located in Cleveland, Ohio, is a manufacturer of both specialty and basic chemicals with wide applications and worldwide sales. Currently, we are the largest producer of galvanizing fluxes in the world, and sell products in 19 countries. But we're a small company, with only 35 employees and under $12,000,000 in annual revenues. Our primary competitors are domestic, European, and increasingly Asian.

I am also the current Chairman of the Board of Directors for the Ohio Manufacturers' Association. The OMA, with its' 2500 member companies is the voice of manufacturing in Ohio the strength of Ohio's economy.

Today, as job providers in Ohio, manufacturers employ over a million people directly and countless million others in the service, finance and other industries employed indirectly by Ohio's manufacturing companies.

As you know, Ohio is an energy intensive state that ranks in the top five nationwide in both commercial and residential energy consumption.

To maintain a competitive advantage in today's tough global marketplace, it is essential that Zaclon and Ohio's other manufacturers have access to dependable, low cost energy sources. But in recent years, energy, and more specifically natural gas, has been anything but low cost. And fuel switching related to compliance with ever tightening air regulations coupled with inadequate exploration and drilling for natural gas is a major factor in this unprecedented run-up and volatility in natural gas prices. As the manufacturing economy improves and as more fuel switching occurs, the problem will only get worse. The high price and volatility of natural gas has threatened and continues to threaten the very existence of small and medium sized manufacturers like Zaclon. In that respect, my company's experiences are a good illustration. The charts that I've included with my testimony tell the story.

This first graph shows Zaclon's Energy/Utility Costs by medium over the past 15 years. It demonstrates both the magnitude and volatility of expenditures that my company has faced during that time. By itself, this chart is interesting enough in that it shows a 63 percent increase in natural gas costs from 1999 to 2002. The run-up in natural gas prices back in 2001 nearly put us out of business despite imposing an energy surcharge on our customers.

What is more revealing, however, is this next graph which superimposes Zaclon's product sales on the energy cost numbers over the past 10 year period.

This combination of increasing energy costs with declining sales revenues is unsustainable for any length of time. We are running out of other cost reduction opportunities, and we really can't pass the increases on to our customers without giving up a significant share of the U.S. market to our overseas competitors.

To further emphasize the impact of escalating natural gas prices on Zaclon, the next two pie charts show a comparison of my company's total cost structure between the most recent year 2002—and 1999 before the run up of natural gas costs.

As you can see energy costs have increased from 10 percent in 1999, which was pretty typical for years before 1999, to 15 percent in 2002. And what's causing this problem is natural gas price. The final chart shows Zaclon's delivered cost per MCF of natural gas for a 15-year period.

You can see that except for predictable seasonal swings, the price of natural gas was stable until recent years. Since that time it is high and unstable. This makes running our business very difficult, and often unprofitable. Soaring energy costs combined with a tough global marketplace represent a serious threat to Zaclon's existence.

In closing, I strongly urge you to consider carefully the impact of what you do in this committee on the competitiveness of companies like Zaclon. Any additional legislation that encourages fuel switching to natural gas without addressing the supply side of the equation could very well put me out of business.

Thank you for the opportunity to testify here today.

I would be happy to answer any questions.

STATEMENT OF RICHARD A. METZ, UNIMARK L.L.C.

Natural Gas is the most environmentally friendly fossil fuel. On the other hand, it is a fuel which requires special handling in order to deliver it from the supply source to the consumer. Currently, it is moved through pipelines, which limits the supply source to production areas that are accessible to pipelines.[1] This makes the United States primarily dependent upon supply sources in North America.

Although the supply of gas has been adequate to meet the needs of consumers over the past 25 years, the free market price of gas today reflects the tightening of supply/demand equation. First, the attached graph (Exhibit "A", Gas Production in the United States) reflects the daily average volume of gas (Dry Gas) produced in the United States over the past 15 years.[2] As you can see over this period, summer curtailment of gas is now nonexistent.[3] Since 1996 annual gas production has been at more than 97 percent of peak capacity. No additional supply exists at this time to take on additional demand.

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[1]For 2002 LNG imports represented 1.1 percent of the total U.S. consumption.

[2]Data source EIA Natural Gas Monthly

[3]Exhibit "B" details the same information in tabular form.

There have been periods when consumer demand exceeds the supplier's ability to meet that demand. When this occurs, the price of gas begins to increase until the price gets to a level that an existing consumer ceases to consume gas. This process repeats itself until the demand level is in equilibrium with supply. The industry nomenclature for this process is "Demand Destruction." The loss of existing demand hurts the industry affected, the suppliers, and ultimately the overall U.S. economy. The attached graph[4] (Exhibit "C") shows that since 2000 the price of gas has had periods of dramatic increases. This is another point on the curve which demonstrates that supply/demand balance for gas is very tight.

Finally, the winter space heating requirements of the residential and commercial sectors are major consumers of gas[5] and the consumption rate is directly tied to the winter temperatures.[6] On a cold day consumption can exceed 90 BCF. At the same time the U.S. production and Canadian imports are approximately 62 BCF per day. In order to meet this additional demand, stored gas must be withdrawn to meet the shortfall. Exhibit "D" provides a historical perspective of the withdrawal and injection into storage. The storage level for the winter season of 2002–2003, although starting at a normal level, was drawn down beyond the level of the prior 4 years. The first thought is: the past winter was colder than normal. It wasn't. Exhibit "E" shows the cumulative Heating Degree Days[7] for a normal winter and for the past winter. The past winter, although colder than most of the recent winters, was still 4 percent warmer than normal. Therefore, the current low storage level can't be attributed to an abnormally cold winter.

When the winter is over and storage is depleted, the entities supplying gas to the residential and commercial customers have to refill storage (fill season) in order to meet the winter demand again next year. As things now stand (April 25, 2003), it will take an average storage injection rate of 12.7 BCF per day during the remainder of the fill season to get back to the storage level that existed last year at the beginning of winter. This compares to the average fill rate for the prior 5 years of 9.2 BCF per day. This increase in storage demand of 3.5 BCF per day has to come from somewhere. At the current time it can't come from the supply side, so it has to come out of existing demand and is done so, as stated earlier, by the price of gas increasing to the point where an existing consumer can't afford to burn gas and, either shuts in its facility, or switches to an alternate energy source.

If the government then mandates that electric generators have to reduce their emissions (quick fix is replacement of coal fired generators with gas fired ones) this will add additional demand to the supply/demand equation and result in higher prices.

The other side of the equation is that higher prices should lead to additional supply, either through additional drilling or increased imports. Although increased imports (LNG) is the hot buzz word for additional gas supplies it will be a long and slow process for LNG to have a meaningful impact. This results in additional supplies having to come from drilling. It is a time consuming process to find and develop additional supplies. It is even harder when the government has declared many onshore and offshore areas off limits for drilling. The producing sector will fight the good fight, but it is much harder to prevail with one hand tied behind its back.

The bottom line is additional stress on the supply of natural gas will lead to economic displacement of industry which can't afford to pay higher prices and still be competitive. I am confident that the producing industry can meet the challenge of supplying gas to the consumers, but it will have to be at higher prices. These prices will have to be even higher if areas of this country are off limits to exploration.

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[4]Exhibit "C" demonstrates the historic value of the "Gas Futures 12 Mo. Forward Average" as traded on the NYMEX.

[5]Represent over 43 percent of total gas consumption.

[6]The demand for gas by these two sectors varies such that the average annual consumption for 2002 was only 55 percent of the peak monthly usage.

[7]A Heating Degree Day is a day in when the average of the high & low temperature is less than 65 F. For example, if the high and low on a day is 50 F and 20 F the average is 35 F, resulting in a 30 Heating Degree Day, (30 = 65 F–35 F).

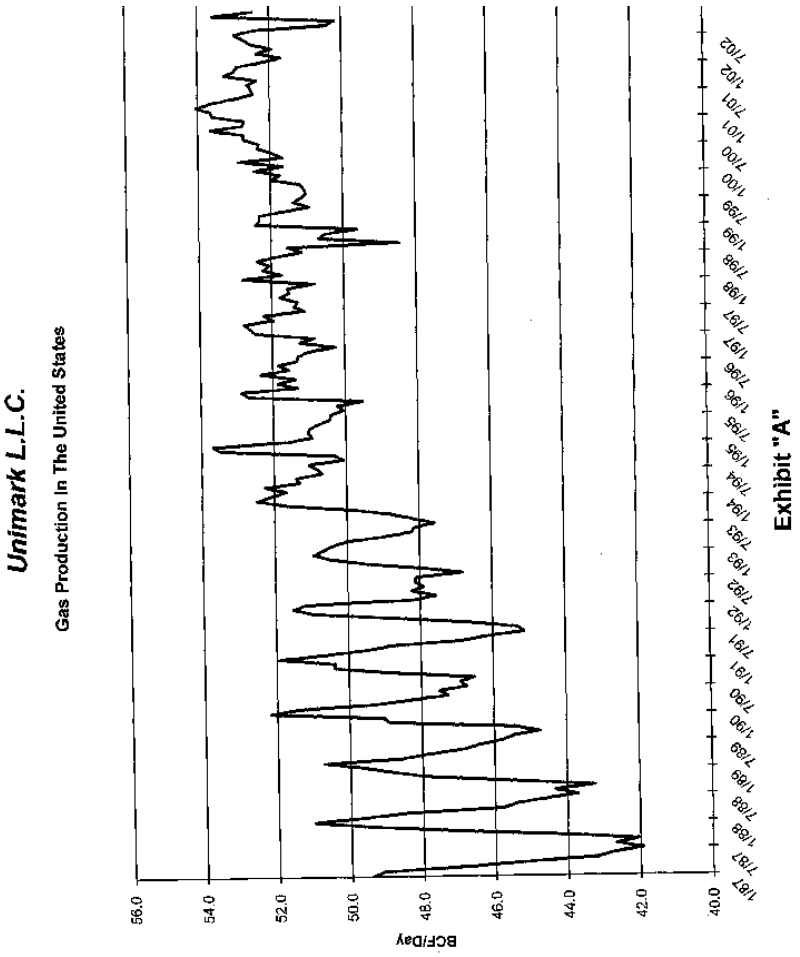

Unimark L.L.C.
Gas Production In The United States
BCF/Day
56.0
54.0
52.0
50.0
48.0
46.0
44.0
42.0
40.0
1/87
7/87
1/88
7/88
1/89
7/89
1/90
7/90
1/91
7/91
1/92
7/92
1/93
7/93
1/94
7/94
1/95
7/95
1/96
7/96
1/97
7/97
1/98
7/98
1/99
7/99
1/00
7/00
1/01
7/01
1/02
7/02

Exhibit "A"

UNIMARK L.L.C.

US DRY GAS PRODUCTION

YEAR	PEAK BCF/MO	PEAK BCF/D	ANNUAL BCF/YR	ANNUAL BCF/D	ANNUAL DAY AS % PEAK DAY
87	1,533	49.5	16,536	45.3	91.61%
88	1,578	50.9	17,103	46.7	91.80%
89	1,579	50.9	17,311	47.4	93.11%
90	1,620	52.3	17,810	48.8	93.37%
91	1,610	51.9	17,698	48.5	93.36%
92	1,586	51.2	17,840	48.7	95.27%
93	1,627	52.5	18,095	49.6	94.46%
94	1,664	53.7	18,821	51.6	96.06%
95	1,639	52.9	18,599	51.0	96.38%
96	1,570	52.3	18,854	51.5	98.43%
97	1,636	52.8	18,902	51.8	98.13%
98	1,637	52.8	18,708	51.3	97.06%
99	1,625	52.4	18,832	51.6	98.43%
00	1,663	53.6	19,212	52.5	97.85%
01	1,675	54.0	19,375	53.1	98.24%
02	1,607	53.6	19,026	52.1	97.31%

2002 - Through 12/2002

Exhibit "B"

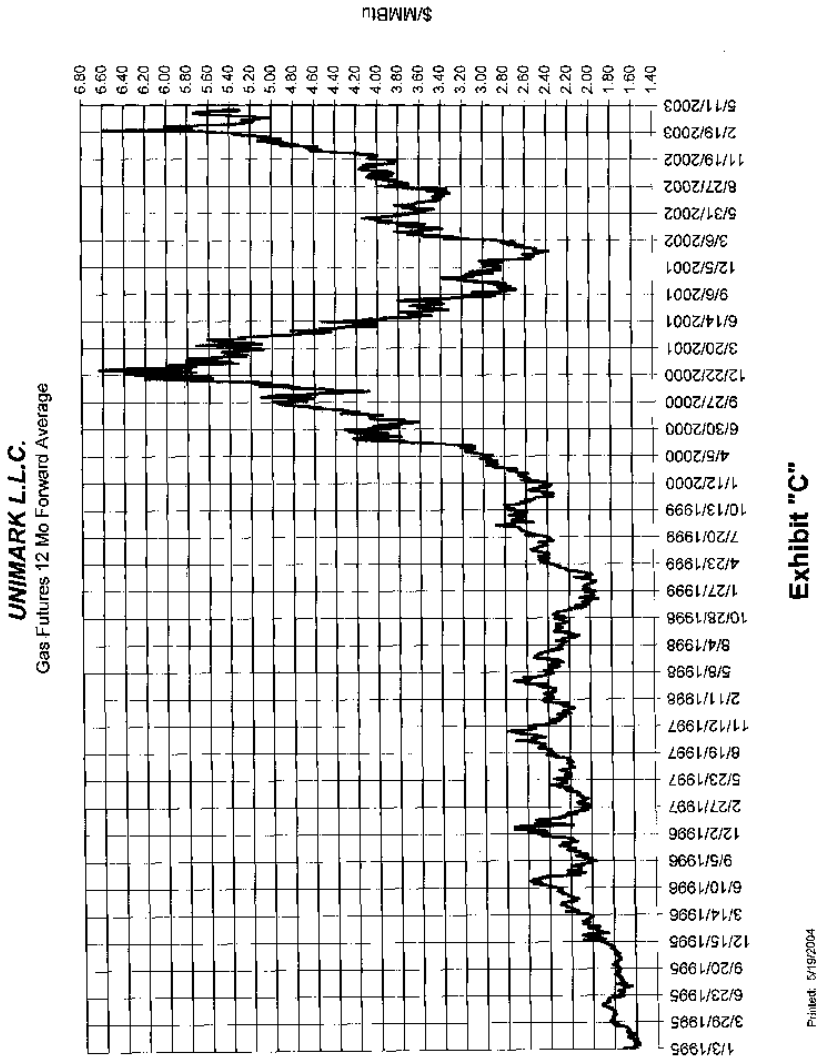

$/MMBtu
6.80
6.60
6.40
6.20
6.00
5.80
5.60
5.40
5.20
5.00
4.80
4.60
4.40
4.20
4.00
3.80
3.60
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
5/11/2003
2/19/2003
11/19/2002
8/27/2002
5/31/2002
3/6/2002
12/5/2001
9/6/2001
6/14/2001
3/20/2001
12/22/2000
9/27/2000
6/30/2000
4/5/2000
1/12/2000
10/13/1999
7/20/1999
4/23/1999
1/27/1999
10/28/1998
8/4/1998
5/8/1998
2/11/1998
11/12/1997
8/19/1997
5/23/1997
2/27/1997
12/2/1996
9/5/1996
6/10/1996
3/14/1996
12/15/1995
9/20/1995
6/23/1995
3/29/1995
1/3/1995
UNIMARK L.L.C.
Gas Futures 12 Mo Forward Average
Printed: 5/19/2004

Exhibit "C"

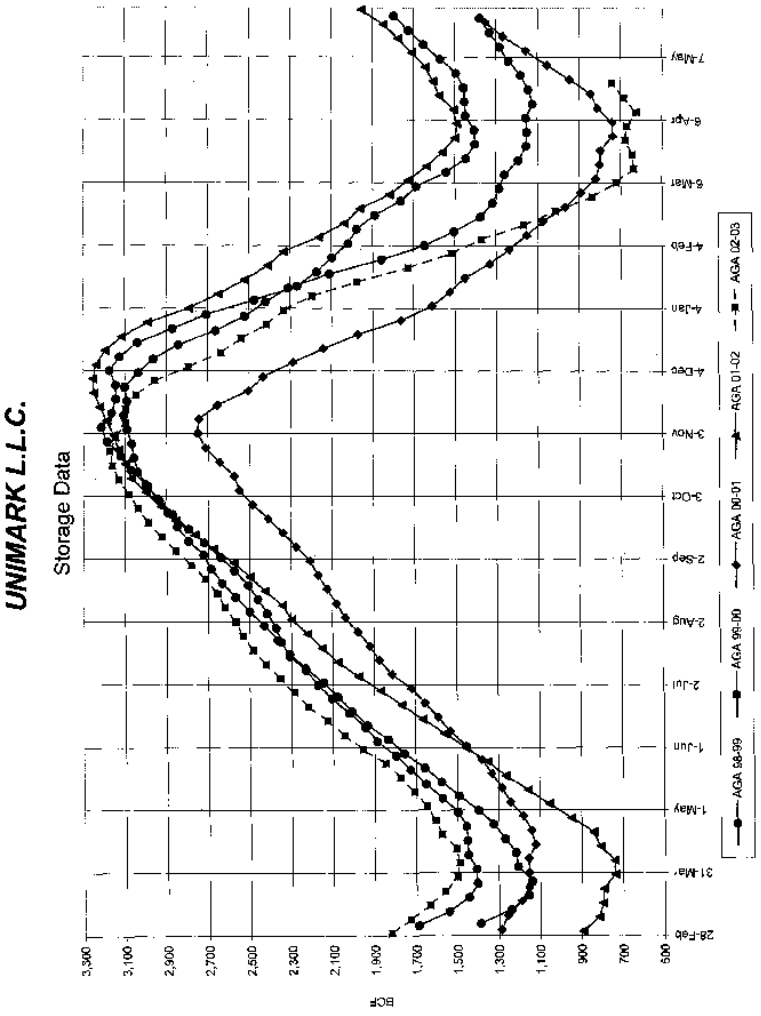

UNIMARK L.L.C.
Storage Data
BCF
3,300
3,100
2,900
2,700
2,500
2,300
2,100
1,900
1,700
1,500
1,300
1,100
900
700
500
28-Feb
31-Mar
1-May
1-Jun
2-Jul
2-Aug
2-Sep
3-Oct
3-Nov
4-Dec
4-Jan
4-Feb
6-Mar
6-Apr
7-May
AGA 98-99
AGA 99-00
AGA 00-01
AGA 01-02
AGA 02-03

Exhibit "D"

UNIMARK L.L.C.

Weekly Customer-Weighted Heating
Degree Days

Week Ending	Normal	Actual	Colder/ (Warmer)	Colder/ (Warmer) % Variance	Cumulative Normal	Cumulative Actual	Cumulative Colder/ (Warmer)	Cumulative Colder/ (Warmer) % Variance
08/31/02	6	1	(5)	-83%	6	1	(5)	-83%
09/07/02	9	2	(7)	-78%	15	3	(12)	-80%
09/14/02	13	4	(9)	-69%	28	7	(21)	-75%
09/21/02	21	6	(15)	-71%	49	13	(36)	-73%
09/28/02	30	22	(8)	-27%	79	35	(44)	-56%
10/05/02	41	20	(21)	-51%	120	55	(65)	-54%
10/12/02	54	44	(10)	-19%	174	99	(75)	-43%
10/19/02	67	91	24	36%	241	190	(51)	-21%
10/26/02	83	105	22	27%	324	295	(29)	-9%
11/02/02	98	134	36	37%	422	429	7	2%
11/09/02	113	120	7	6%	535	549	14	3%
11/16/02	130	115	(15)	-12%	665	664	(1)	0%
11/23/02	146	138	(8)	-5%	811	802	(9)	-1%
11/30/02	162	177	15	9%	973	979	6	1%
12/07/02	176	206	30	17%	1,149	1,185	36	3%
12/14/02	190	178	(12)	-6%	1,339	1,363	24	2%
12/21/02	203	154	(49)	-24%	1,542	1,517	(25)	-2%
12/28/02	212	194	(18)	-8%	1,754	1,711	(43)	-2%
01/04/03	220	167	(53)	-24%	1,974	1,878	(96)	-5%
01/11/03	223	177	(46)	-21%	2,197	2,055	(142)	-6%
01/18/03	224	237	13	6%	2,421	2,292	(129)	-5%
01/25/03	221	244	23	10%	2,642	2,536	(106)	-4%
02/01/03	217	198	(19)	-9%	2,859	2,734	(125)	-4%
02/08/03	210	199	(11)	-5%	3,069	2,933	(136)	-4%
02/15/03	201	208	7	3%	3,270	3,141	(129)	-4%
02/22/03	189	181	(8)	-4%	3,459	3,322	(137)	-4%
03/01/03	177	216	39	22%	3,636	3,536	(98)	-3%
03/08/03	165	191	26	16%	3,801	3,729	(72)	-2%
03/15/03	153	148	(5)	-3%	3,954	3,877	(77)	-2%
03/22/03	139	91	(48)	-35%	4,093	3,968	(125)	-3%
03/29/03	126	87	(39)	-31%	4,219	4,055	(164)	-4%
04/05/03	113	100	(13)	-12%	4,332	4,155	(177)	-4%
04/12/03	100	117	17	17%	4,432	4,272	(160)	-4%
04/19/03	86	65	(21)	-24%	4,518	4,337	(181)	-4%
04/26/03	73	82	9	12%	**4,591**	**4,419**	**(172)**	**-4%**

A +/- 10% DEVIATION FOR THE ENTIRE HEATING SEASON IS RARE AND CONSIDERED AN EXTREMELY WARM OR COLD WINTER

Exhibit "E"

STATEMENT OF STEVE THUMB, ENERGY VENTURES INC.

Executive Summary

The U.S. natural gas supply sector is currently being challenged to meet the nation's demand for natural gas. This has caused natural gas prices to increase to record levels and significant demand destruction within the non-electric sectors for natural gas demand. The primary reason for this phenomenon is that U.S. gas production has been declining for each of the last six quarters. The cumulative effect

of this decline has been to reduce U.S. gas production approximately 3.5 BCFD, or 6 percent. This decline in U.S. gas production is occurring throughout the Nation, as five of the seven major supply areas in the U.S. are in decline.

To date the greatest degree of demand destruction has occurred within the industrial sector, where the resulting high gas prices have caused a number of firms to declare bankruptcy and other firms to idle capacity. Both of these events have had an adverse effect on the U.S. economy. To date, total demand destruction within the industrial sector equates to approximately 5.5 BCFD, or 26 percent of total industrial sector gas demand. Higher gas prices also have affected the residential sector, as gas supply costs for this sector have increased approximately $17 billion from the 5 year average for the late 1990's.

This challenge for the U.S. gas supply sector will continue over the intermediate term, as U.S. production levels are projected to continue to decline for some time, primarily because of the limited increase in gas-directed drilling activity despite record gas prices. One of the major reasons for the limited increase in drilling activity is the limitations the industry faces in gaining access to prospective acreage as a result of environmental restrictions and moratoria. The potential reserves that are off limits because of these restrictions, which are increasing rather than decreasing, has been estimated by industry sources at between 200 and 450 TCF. Another significant reason for the limited increase in gas-directed drilling activity is the lack of scale for prospective exploration and development activity. Even though undiscovered reserves exist, many of these reserves are contained in a series of relatively small plays. Majors and large independents need large reserve plays in order to effectively use their staffs, impact their current production levels and effectively allocate capital. Relying on smaller independents to develop these smaller reserve plays has reached a point of diminishing returns because of the downsizing of the U.S. exploration and production industry.

As a result of these and other factors, the industry will be challenged to maintain, let alone increase, production levels from traditional supply areas. Instead, the industry will have to rely on a series of emerging sources of gas supply to fill any gap between supply and demand. However, it will be an extended period of time before these emerging sources of supply are able to make a significant contribution to the U.S. supply sector. As a result, any acceleration in U.S. gas demand requirements only will exacerbate the challenge for the U.S. supply sector and lengthen the period of high gas prices and further demand destruction in other sectors.

With respect to these emerging sources of supply, which include deep reserves below 15,000 feet, the complex subsalt play, reserves offshore Eastern Canada, frontier coalbed methane basins, new LNG terminals and reserves from the Arctic areas of both Canada and the U.S., the challenge and extended timeframe for the industry to develop these highly complex and very capital intensive sources of supply cannot be emphasized enough. For example, despite a number of industry announcements concerning possible new LNG terminals, the FERC has granted only one certificate for a new terminal and only one other project has applied for a certificate. With respect to the potential for Arctic gas supplies the earliest date for a completion of a pipeline to deliver these supplies is approximately 2009 and these supplies will be from Canada's MacKenzie Delta. Arctic gas supplies from the Prudhoe Bay will not be available until 2013 at the earliest. To place the potential of these massive supply projects in perspective, the initial combined capacity of these two Arctic pipelines, net of the incremental gas demand requirements for Canada's heavy oil sands developments, will only be 1.3 BCFD, or 475 BCF per year, greater than the decline in U.S. production over the last six quarters.

One of the significant impacts of the proposed increases in clean air requirements is that it will cause coal-fired generation to be reduced. A significant portion of this decline in coal-fired generation will need to be made up by additional gas-fired generation. This higher level of gas-fired generation will increase natural gas demand requirements within the electric sector, which will further exacerbate the challenge to the U.S. gas supply sector. This increasing dependence of the electric sector on gas-fried generation is most evident in the recent experience of the industry. Since 1996 gas demand within the electric sector has increased approximately 4.7 BCFD, or 45 percent. This is one of the major reasons for the current challenge within the U.S. gas supply sector.

Of particular concern is both the acceleration of the target dates for the proposed changes in clean air requirements and the increases in the levels of emission reductions contained in some proposed initiatives. Accelerating the time line for these changes in clean air requirements will represent a significant challenge for the U.S. gas supply sector, as it is improbable that the time line for the large, complex and expensive emerging sources of gas supply required to meet future demand increases can be accelerated. In fact, the more probable scenario is that there will be delays

in the time lines for some of these emerging sources of supply, which has been the case for offshore Eastern Canada.

Similarly, increasing the levels of emission reductions will cause an even greater reduction in coal-fired generation and increases in both gas-fired generation and gas demand within the electric sector. This will only heighten the challenge for the gas supply sector. Of particular concern are the carbon dioxide limitations, since the power industry has no viable control options and must rely totally upon switching generation to lower carbon containing fuels, of which the most significant is natural gas. Carbon dioxide limits, because they place an effective cap on fossil fuel generation, significantly increase the challenge for the U.S. gas supply sector.

Of the various Clean Air Act initiatives currently being considered S 366 (Clean Power Act of 2003) and S 843 (Clean Air Planning Act of 2003), with their accelerated time tables for emission reductions and their large emission reduction requirements, particularly their CO_2 emission reduction requirements, would represent the greatest challenge for the U.S. gas supply sector. With respect to S 485 (Clear Skies Act of 2003) it would also present a challenge for the U.S. gas supply sector. However, by eliminating the mandatory carbon dioxide limitations and providing for a longer implementation period for the required emission reductions it presents a challenge that may, at least, be manageable.

In summary, the U.S. gas supply sector is challenged to meet existing demand levels. This challenge, which likely will extend over the intermediate term because of limitations associated with traditional supply areas, has resulted in natural gas prices reaching record levels and significant demand destruction within the non-electric sectors for natural gas demand.

The acceleration of the proposed clean air requirement timelines and higher levels of emission reductions will only serve to heighten and extend this challenge to the U.S. gas supply sector, as these changes in clean air requirements will increase gas demand in the electric sector. Furthermore, since the gas supply sector is heavily dependent on a series of complex and capital intensive emerging sources of supply to meet projected increases in natural gas demand, it is doubtful that the timeline for additional gas supplies can be accelerated materially. In particular, the proposed carbon dioxide limits may place the gas industry in a position where it is severely challenged to meet the increases in electric sector gas demand requirements. Empirical evidence to date is that when the U.S. gas supply sector is challenged to this degree the net result is that natural gas prices will be pushed to record levels, with all the attendant cost increases for the other sectors, and demand destruction within the non-electric sectors for natural gas demand.

Current Status U.S. Gas Supply

Over the last 2 years the U.S. natural gas supply sector has been challenged to meet demand. The primary reason for this phenomenon is that U.S. production has been declining for each of the last six quarters, as illustrated in Exhibit 1.[1] This decline in U.S. production, which equates to approximately 3.5 BCFD, or 6 percent of total production, has caused natural gas prices to reach record levels[2] and resulted in significant demand destruction[3] in the non-electric sectors for natural gas demand. The latter has impacted adversely the U.S. economy.[4]

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[1]There also have been declines in production in Canada's Western Canadian Sedimentary Basin as documented in "Canada Looks to Other Sources to Offset Steep WCSB Declines," Natural Gas Week, March 10, 2003, p. 16 and "Analysts Sound the Alarm on U.S., Canadian Gas Production" Natural Gas Week, April 28, 2003, pp 5–6.

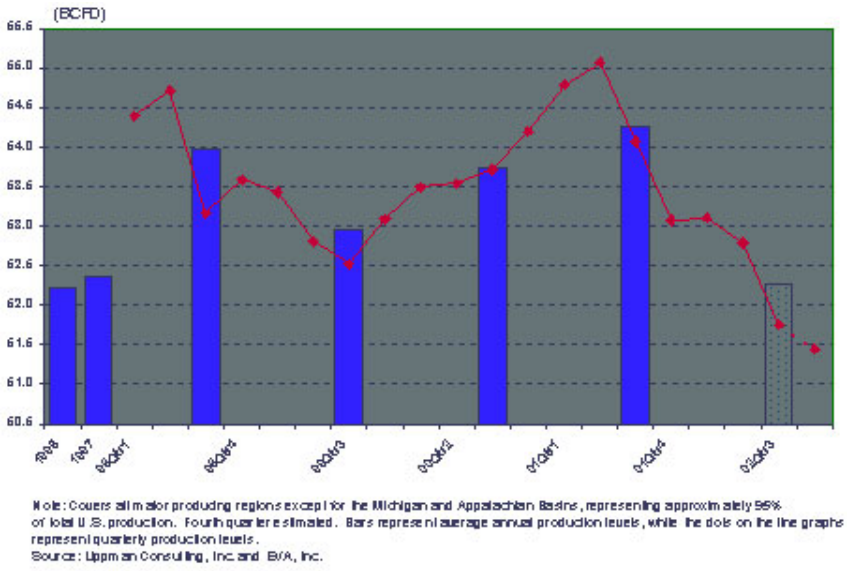
[2]See Exhibit A–1 in the Appendix for a summarization of natural gas prices.

[3]The term demand destruction is used often in the natural gas industry to describe the loss of demand as a result of high gas prices. As discussed in subsequent sections of this paper it often involves firms going out of business and plants idling capacity because these entities cannot pass through the high gas costs to their customers.

[4]American Chemical Council, Background Paper on Natural Gas Price Shocks and The Economy, February 28, 2003.

EXHIBIT 1

U.S. NATURAL GAS PRODUCTION



Note: Covers all major producing regions except for the Michigan and Appalachian Basins, representing approximately 95% of total U.S. production. Fourth quarter estimated. Bars represent average annual production levels, while the dots on the line graphs represent quarterly production levels.
Source: Lippman Consulting, Inc. and EIA, Inc.

This decline in U.S. production is occurring throughout the United States, as five of the seven major supply areas in the U.S. are in decline.[5] The areas in decline include the San Juan basin, the Permian basin, the Mid-Continent area, the onshore Gulf Coast area and the shelf of the Gulf of Mexico. Of these areas the most significant decline has occurred in the shallow water region, or shelf, of the Gulf of Mexico, which historically has been the most prolific producing area in the U.S., as it at one time accounted for 26 percent of U.S. production. The steady decline in production from the shelf of the Gulf of Mexico is summarized in Exhibit 2. Furthermore, the recent development of the deepwater region of the Gulf of Mexico, with its extensive use of modern exploration and production technology, has not been able to offset the decline in production from the shelf, and as a result production for the entire Gulf of Mexico is declining.

[5]See Exhibit A–2 and A–3 in the Appendix.

EXHIBIT 2

PRODUCTION FROM SHALLOW WATERS (SHELF) IMPACT ON DEMAND

Year	Shallow Water Production (BCFD)	Net Decline	
		Amount (BCFD)	Percent
2002[1]	9.42	(0.61)	(6%)
2001	10.03	(0.12)	(1%)
2000	10.15	(0.47)	(4%)
1999	10.62	(1.00)	(9%)
1998	11.62	(1.13)	(9%)
1997	12.75	-	-
Total		(3.33)	(26%)

1 2002 data estimated.

Source: MMS, EIA and EVA.

The supply and demand imbalance resulting from this decline in U.S. production has caused natural gas prices to rise to record levels, which has caused, in turn, a decline in natural gas demand. This decline in demand has been most pronounced in the industrial sector where firms have had to idle capacity or have gone out of business because they can no longer compete at the current elevated prices for natural gas. This decline in industrial activity, which has impacted adversely the U.S. economy, has been most pronounced in the basic chemicals and primary metals sectors, with the latter being impacted adversely by higher gas-fired electricity prices.[6][7]

With respect to the chemical industry, which accounts for over 50 percent of industrial sector demand, there has been a fundamental shift in the competitiveness of the U.S. chemical industry versus overseas facilities because of the higher U.S. gas prices. This has occurred because the U.S. chemical sector is heavily based upon natural gas and natural gas liquids, while the European and Asian chemical producers are based heavily on oil (i.e. naphtha). Higher U.S. gas prices have caused the ratio between gas and oil prices to shift from 0.6 in the 1990's to 1.0 at present, which has provided European and Asian chemical producers with a competitive advantage. One example of the impact of this shift in competitive position between these regions is the recent closure of a Louisiana ethylene and plastics plant in order to move operations to Germany, where gas prices are lower and more stable.

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[6]Bankrupt fertilizer firms include Farmland (Midwest and Louisiana), Vicksburg Chemical (MS), Agrifos (TX), Mulberry Phosphates (FL) and Agway (Syracuse, NY). Mississippi Chemical (Yazoo City, MS) has had a 1 year credit extension and Terra Industries (Sioux City, IA) has acknowledged limited ability to effectively hedge future gas prices. Mississippi Chemicals has permanently shut down its Donaldsonville, LA plant and Air Products has ceased production at its Pace, FL plant. (Source: Company announcements and trade press.)

[7]Currently idled aluminum plants include Alcan's West Virginia plant, the Mead, Tacoma and Trentwood, WA plants for bankrupt Kaiser, Alcoa's Troutdale, OR and Rockdale, TX plants, the bankrupt Longview, WA plant and the Goldendale plant. These eight plants may never reopen. At present in the Pacific Northwest, which is the heart of the U.S. aluminum industry, only two plants are operating (i.e., Glencore's Columbia Falls in Kalispell, MT at 20 percent capacity and Alcoa's Ferndale plant in Bellingham, WA). (Source: Company announcements and trade press.)

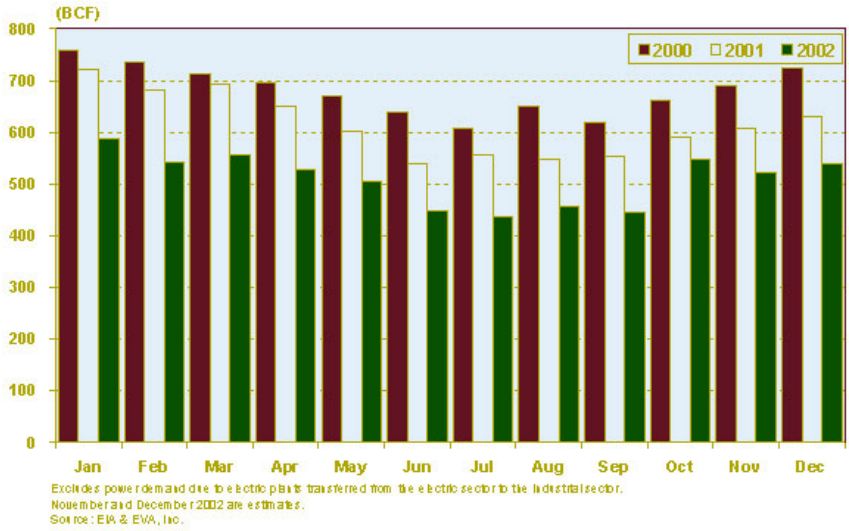
With respect to the net impact of higher prices on industrial sector demand, the best estimate to date is that industrial sector demand has declined approximately 5.5 BCFD, or 26 percent, over the last 2 years, as illustrated in Exhibit 3.[89]

Impact Of Cost

In addition to causing a reduction in demand within some sectors, the high gas prices resulting from declining production levels have increased substantially the costs of natural gas supply for the other sectors. For example, in the residential sector the supply component for residential gas costs has increased approximately $17 billion from the 5 year average during the late 1990's.

EXHIBIT 3

INDUSTRIAL DEMAND



Intermediate Term Outlook For U.S. Gas Supply

This challenge for the U.S. gas supply sector likely will continue over the intermediate term, as U.S. production levels are projected by EVA and others to continue to decline,[10] as gas-directed drilling activity has been slow to respond to increases in natural gas prices and decline rates for existing production are high.[11][12] One of the major reasons for the limited increase in drilling activity during this period of elevated gas prices is the limitations the industry faces in gaining access to prospective acreage, as a result of environmental restrictions and moratoria.[13] While there is tension between the exploration and production industry and other industry observers over the exact amount of the potential reserves that are not accessible because of the various environmental restrictions, the figure has been placed at ap-

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[8]"As Gas Prices Increase To New Norm, Chemical Sector Could Be Hit Hard," Inside FERC's Gas Market Report, February 28, 2003, pp 9–10; and "Chemical Analysts Grow Bearish As U.S. Sector's 'Golden Era' Closes," Natural Gas Week, February 24, 2003, p. 5.

[9]"Record U.S. natgas prices punish manufacturers" Reuters, February 25, 2003.

[10]"Analysts See Bullish Gas Market Rebalanced by Pricing Factors," Natural Gas Week, December 30, 2002, p. 3; and "Analysts Sound The Alarm on U.S., Canadian Gas production," Natural Gas Week, April 28, 2003, pp 5–6; and "CERA Warns of Fragile Balance In Supply/Demand Outlook for 2003," Inside FERC's Gas Market Report, February 14, 2003, p. 1.

[11]See Exhibit A–4 in the Appendix.

[12]The annual rate of decline in production from new U.S. wells accelerated to 27 percent in 2002 from 17 percent in 1990. See "EIA's Rosy Gas Supply Projections in Doubt," Natural Gas Week, March 10, 2003, p. 9.

[13]"Witnesses Urge Greater Access As Check for Rising Gas Prices," Natural Gas Week, March 3, 2003, p. 7; and "Producers Concerns Unheeded In New Rockies Reserves Study," Natural Gas Week, January 20, 2003, p. 3–4 and "AGA Calls For Access to Closed Areas: Court Upholds Forest Land Closings," Inside FERC's Gas Market Report, December 20, 2002, p. 16.

proximately 200 TCF by the National Petroleum Council study and even higher by a study conducted by Texaco (i.e., 450 TCF). Furthermore, these environmental limitations on access to prospective acreage are increasing rather than decreasing, even though U.S. production is declining. Recent examples include (a) restrictions on drilling under the Great Lakes even though Canada has done such for years, (b) a nearly 75 percent reduction in the offshore acreage that was planned to be offered in the Gulf of Mexico Sale 181 and (c) Pennsylvania's access restriction of 56 percent of the acreage for the Trenton-Black trend within that State.

Another major reason for the limited increase in gas-directed drilling activity is the lack of scale for prospective exploration and development activity. Even though undiscovered reserves exist, many of these reserves are contained in a series of relatively small plays. Majors and large independents need large reserve plays in order to effectively use their staffs, impact their current production levels and effectively allocate capital. It is this diminishing size and concentration of reserve targets that led the majors away from further development of the shallow waters in the Gulf of Mexico.[14]

Relying on smaller independents to develop these smaller reserve plays has reached a point of diminishing returns because of the downsizing of the U.S. exploration and production (E&P) industry. For example, the tabulation of E&P firms in the U.S. industry by the Oil and Gas Journal has declined from 400 in 1990 to 176 at present, with the smallest firm having assets of only $197,000.[15]

As a result of these and other factors, the industry will be challenged to maintain, let alone increase, production levels from traditional supply areas.[16] Instead, the industry will have to rely on a series of emerging sources of gas supply to fill any gap between supply and demand. However, it will be an extended period of time before these emerging sources of supply are able to make a significant contribution to the U.S. supply sector. As a result, any acceleration in U.S. gas demand requirements only will exacerbate the challenge for the U.S. supply sector and lengthen the period of high gas prices and further demand destruction in other sectors.

Long-Term Outlook For U.S. Gas Supply Sector

Exhibit 4 summarizes the long-term outlook for natural gas demand for several different forecasters. While there are some differences in assumptions for each of these forecasts, they tend to cluster around 30 TCF for 2015.

Exhibit 4

Various Gas Demand Projects For 2015[1]

	Forecast (TCF/Year)				
	PIRA	EEA	Gil	EIA	EVA
Total Gas	28.8	29.3	29.4	29.5	30.5

[1]Source: EIA, Annual Energy Outlook 2002 and EVA.

Reaching this 30 TCF level will be a major challenge for the U.S. supply sector, as empirical evidence to date illustrates that this level of supply cannot be attained by further development of traditional sources of supply. Instead, the industry will have to rely on a series of emerging sources of supply, which include the exploration and/or development of: (1) deeper reserves (i.e., >15,000 ft), (2) the highly complex subsalt play in the Gulf of Mexico, (3) reserves offshore Eastern Canada, (4) new coalbed methane reserves in frontier basins, (5) new LNG terminals and (6) reserves in the Arctic areas of both Canada and the U.S.[17] The challenge and extended timeframe for the industry to develop these highly complex and very capital intensive sources of supply cannot be emphasized enough. For example, it can take up to 9 months on a super computer to process the seismic data associated with the subsalt play, which is still in its infancy.[18] Also, drilling a single well for the deep Madden play in Wyoming, which used to take over a year, still takes over 200 days even

[14]"Drilling Boom Deemed Unlikely Despite Natural Gas Price Surge," Natural Gas Week, March 3, 2003, p. 1.

[15]"Special Report OGJ 200/100" Oil and Gas Journal, September 9, 2002, pp 70–90.

[16]This challenge will continue to exist even during potential periods of downward gas price volatility, which for example might occur do to unforeseen weather events, such as very warm winter weather.

[17]EPRI, Gas Supply Outlook-Gauging Wellhead Deliverability Now and in the Future (1004588), February 2002.

[18]For other non-subsalt exploration plays it typically takes less than a month to process the associated seismic data and that is accomplished on a basic computer.

with the application of significant improvements in drilling technology. Last, a string of expensive dry holes (i.e., approximately $440MM to date) over the last 2 years in exploration for potential reserves offshore Nova Scotia has forced the industry to reevaluate development of the area and delay its time table.[19]

The lengthy timeframe for some of these emerging sources of supply is best illustrated by the time lines for new LNG terminals and the development of a pipeline(s) for Arctic gas supplies. While the Nation is reopening and/or expanding each of the existing four LNG terminals, additional LNG supplies beyond the capabilities of the four terminals will be required to meet projected demand levels. At present, despite a number of industry announcements concerning possible new LNG terminals, the FERC has granted only one certificate for a new LNG terminal and only one other project has applied for a certificate. In addition, there has been the announced cancellation of at least two proposed new LNG terminals, as the combination of stiff resistance, primarily on environmental grounds, and the expensive nature of these facilities have forced several potential industry participants to reconsider their involvement in such projects. Also, the U.S. industry has learned that even with new LNG terminals, it will have to compete with the rest of the world for available supplies. This tension with the rest of the world was made very clear this last winter when, despite record U.S. gas prices, LNG imports were limited to just 15 percent above the levels for the winter of 2000/2001, because of high LNG demand from Asian countries.

With respect to the possibility of Arctic gas supplies, the construction of a gas pipeline from the Arctic region to the North American market place will be a massive project that will task severely the existing infrastructure of the region. At present the earliest possible date for the first of the Arctic pipelines, which will be from Canada's MacKenzie Delta, is the end of 2008 or early 2009. Furthermore, it appears that approximately 75 percent of the initial capacity of this pipeline will be required to meet Canadian gas demand associated with its growing development of heavy oil sands projects.[20] Beyond this there is the possibility of the $19.4 Billion Arctic gas pipeline from Prudhoe Bay, which is projected to be longer than the Great Wall of China. While specifics on the timetable for this massive project are limited, the earliest potential date for a second Arctic gas pipeline appears to be 2013. The possibility of building both Arctic pipelines at the same time is not even being considered by the industry, because of inadequate infrastructure within the region. For example, for the earlier MacKenzie Valley pipeline movements of pipe sections will require one truck haul every 5 minutes along the Yukon highway system and a doubling of the capacity of the White Pass Railway. Furthermore, the tractor and trailer units for these hauls will have to be twice the typical length of such units in order to move the 82-foot sections of pipe.[21]

To further place the challenge to the U.S. supply in perspective, the initial combined capacity of both of these huge Arctic gas pipeline projects, net of the incremental demand for Canada, will be only 1.3 BCFD, or 475 BCF per year, greater than the decline in current U.S. production over the last six quarters. Further increases in the capacity of these projects likely will not occur until several years after the completion of the Prudhoe Bay pipeline project (i.e., approximately 2015 or thereafter).

Impact Of Proposed Clean Air Requirements

One of the significant impacts of the proposed increases in clean air requirements is that it will cause coal-fired generation to be reduced. A significant portion of this decline in coal-fired generation will have to be made up by additional gas-fired generation, as other forms of generation are limited in their ability to increase significantly.[22] This higher level of gas-fired generation will increase natural gas demand

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[19]"East Coast Canada Loses Luster As Petro-Canada Abandons Well," Natural Gas Week, May 5, 2003, p. 16.

[20]"Canadian Energy Exports to U.S. May Slow As Capacity Tightens," Natural Gas Week, April 14, 2003, p. 1.

[21]"Report Says Southern Pipe Route The More Feasible Alternative" Natural Gas Week, February 3, 2003, p. 4 and "The Aboriginal Pipeline Group" Oil & Gas Journal, March 3, 2003, p. 8.

[22]Dependence upon natural gas generation is directly attributable to other power sources having only a very limited ability to offset coal generation losses. Hydro power expansion is limited by the lack of appropriate sites and growing permitting opposition. Nuclear power is hindered by its very high production costs and continuing waste disposal problems. Nor are other renewables able to displace large coal losses because of resource limitations and high costs. For example, areas offering Class 5–7 wind resources are very limited and distant from load centers. Lower class wind resources are far too expensive to develop and transmit. In addition, because

Continued

requirements within the electric sector, which will further exacerbate the challenge to the U.S. gas supply sector. This increasing dependence of the electric sector on gas-fired generation is most evident in the recent experience of the industry. Since 1996 gas demand within the electric sector has increased approximately 1.7 TCF (i.e., 4.7 BCFD), or 45 percent. This is one of the major reasons for the current challenge within the U.S. gas supply sector.

Of particular concern is both the acceleration of the target dates for the proposed changes in clean air requirements and the increases in the levels of emission reductions contained in some proposed initiatives. Accelerating the time line for these changes in clean air requirements will represent a significant challenge for the U.S. gas supply sector, as it is improbable that the time line for the large, complex and expensive emerging sources of gas supply that will be required to meet future demand increases can be accelerated. In fact, the more probable scenario is that there will be delays in the time lines for some of these emerging sources of supply, which has been the case for the development of the region offshore Eastern Canada.

Similarly, increasing the levels of emission reductions will cause an even greater reduction in coal-fired generation and increases in both gas-fired generation and gas demand within the electric sector. This will only heighten the challenge for the gas supply sector. Of particular concern are the carbon dioxide limitations since the power industry has no viable control options and must rely totally upon switching generation to lower carbon containing fuels, of which the most significant is natural gas. Carbon dioxide limits, because they place an effective cap on fossil fuel generation, significantly increase the challenge for the U.S. gas supply sector.

If the natural gas supply sector is not capable of meeting the challenge of increased gas demand within the electric sector, as a result either of an accelerated time table for new clean air requirements or the increased emission reduction levels proposed in some initiatives, then the alternative is for an extended period of high gas prices and demand destruction within the other sectors for natural gas demand. Both these latter items will have an adverse impact on the U.S. economy. From one perspective this alternative is a mirror image of what is currently occurring within the U.S. gas industry.

Current Clean Air Act Initiatives

The three Senate proposals have significantly different impacts on the natural gas industry. S 366 (Clean Power Act of 2003) poses by far the largest natural gas supply challenge because (1) its much tighter carbon dioxide and SO_2 limitations create the greatest demand shifts toward natural gas; (2) its much shorter compliance period gives the gas supply industry the least time to expand its supply base; (3) its much tighter mercury limit is heavily dependent upon mercury control technology performance that has not been commercially demonstrated yet and may force the shutdown of a large portion of the existing coal power plant fleet; and (4) its new source standards forces the greatest amount of older coal based capacity to be retired.

In comparison to S 366, S 834 (Clean Air Planning Act of 2003) will reduce the challenge to the natural gas supply sector by phasing in slightly higher limitations over a longer period (i.e., four additional years). Its longer scheduled compliance period allows the natural gas industry valuable time to expand its supply base, while reducing natural gas demand pressure by permitting greater coal generation with its alternative emission limitations. Also, mercury technology risk is greatly reduced, as limitations are more in line with current DOE research targets.

Finally, S 485 (Clear Skies Act of 2003) also presents a challenge for the U.S. gas supply sector. However, by eliminating mandatory carbon dioxide limitations and providing for longer periods for implementing the required emission reductions, it presents a challenge that may, at least, be manageable.

Conclusions

Currently the U.S. gas supply sector is challenged to meet existing demand levels. This challenge, which likely will extend over the intermediate term because of limitations associated with traditional supply areas, has resulted in natural gas prices reaching record levels and significant demand destruction within the non-electric sectors for natural gas demand.

The acceleration of the proposed clean air requirement time lines and higher levels of emission reductions will only serve to heighten and extend this challenge to the U.S. gas supply sector, as these changes in clean air requirements will increase

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wind power units only operate at best 25 to 33 percent of the time, additional gas-fired generation is required to supplement wind power units in order to replace the lost base load coal-fired generation.

gas demand in the electric sector. Furthermore, since the gas supply sector is heavily dependent on a series of complex and capital intensive emerging sources of supply to meet projected increases in natural gas demand, it is doubtful that the timeline for additional gas supplies can be accelerated materially. In particular, the proposed carbon dioxide limits may place the gas industry in a position where it is severely challenged to meet the increases in electric sector gas demand requirements. Empirical evidence to date is that when the U.S. gas supply sector is challenged to this degree that the net result is that natural gas prices will be pushed to record levels, with all the attendant cost increases for the other sectors, and demand destruction within non-electric sector for natural gas demand.

APPENDIX

EXHIBIT A–1

HENRY HUB NATURAL GAS PRICE WEEKLY DATA

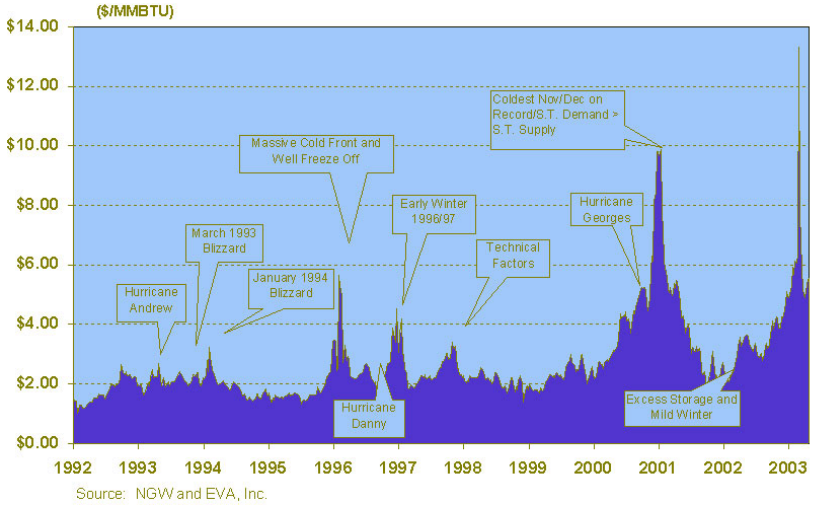
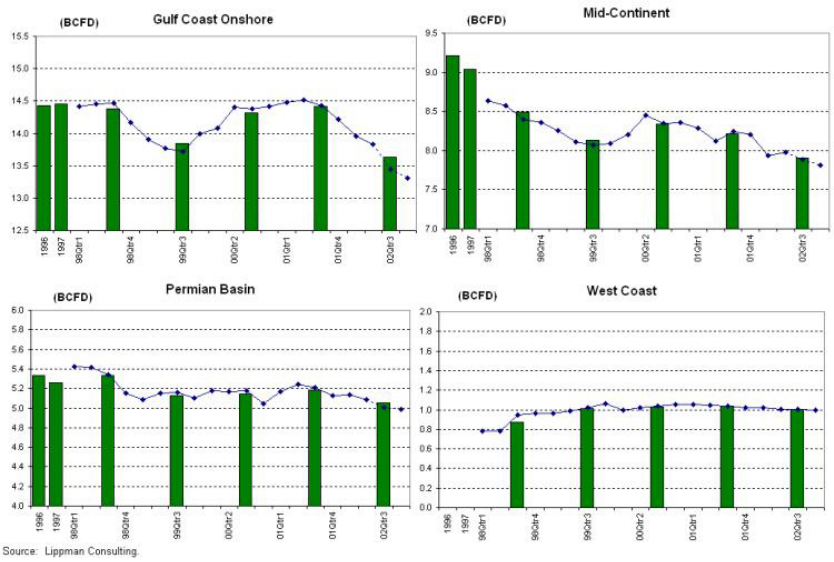


EXHIBIT A–2

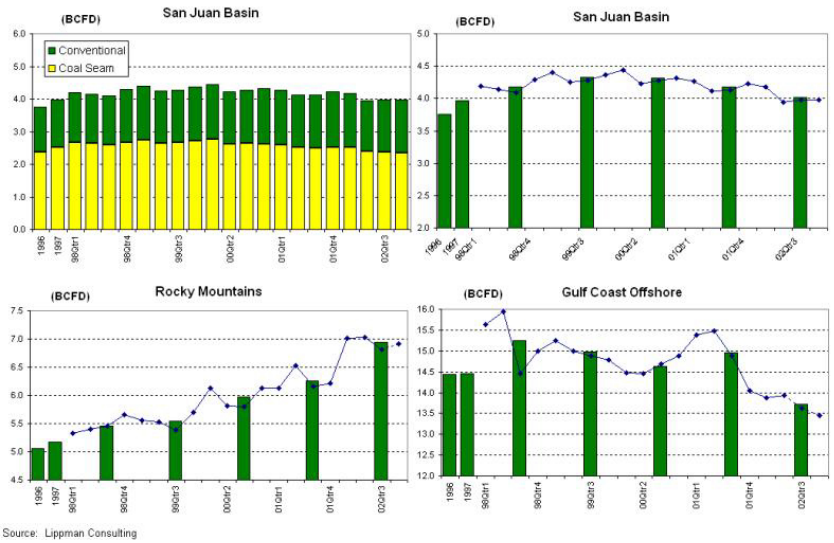
PRODUCTION FROM SELECTED REGIONS I



Source: Lippman Consulting.

EXHIBIT A–3

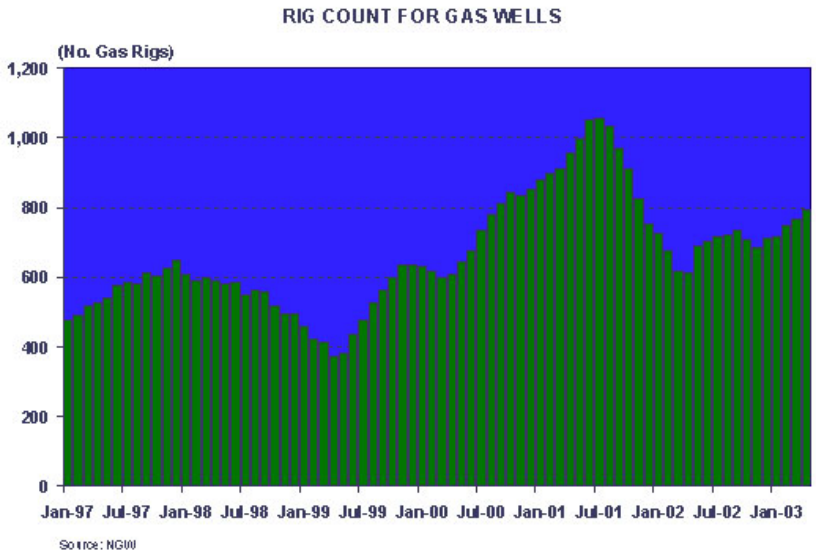
PRODUCTION FROM SELECTED REGIONS II



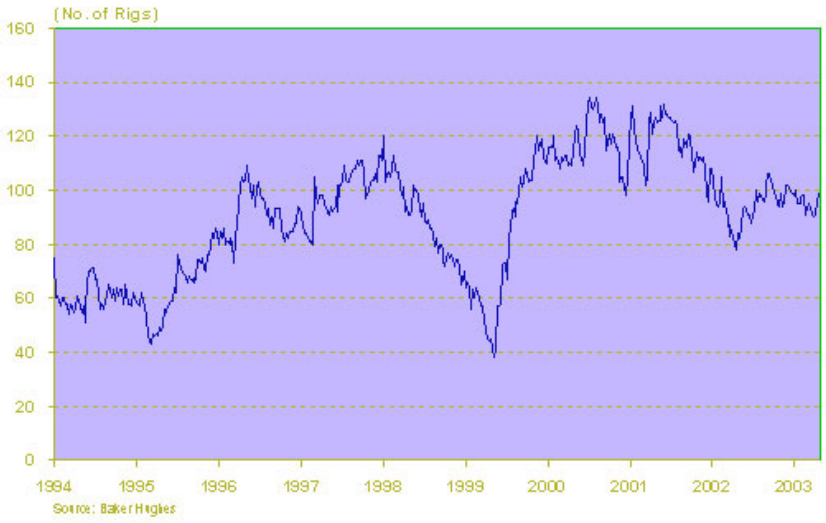
Source: Lippman Consulting

EXHIBIT A–4

RIG COUNT FOR GAS WELLS



RIG COUNT FOR THE GULF OF MEXICO



STATEMENT OF THE AMERICAN CHEMISTRY COUNCIL

The American Chemistry Council welcomes this opportunity to comment on the Clear Skies Act as it relates to the all-important issue of natural gas supply and demand. Our country's standard of living and the economic health of our citizens and our industries that provide the wealth of our jobs are tied intimately with the energy supply including a competitively priced natural gas component.

It is impossible to discuss the benefits of Clear Skies legislation without first asking Congress how it plans to address the larger issue of restoring balance to the natural gas markets.

Over the past decade, environmental legislation and policies, like the Clean Air Act, have had the effect of triggering a dramatic run-up in demand for natural gas. Other environmental policies have put the nation's most promising natural gas reserves off limits. As a result, all consumers are hurt by the high prices that result from the increased demand and shrinking natural gas supply.

American manufacturers are being priced out of the marketplace. Plants are closing. Jobs are moving overseas. Over 35,000 well paying jobs in the chemical industry are at risk due to the latest run-up of natural gas prices and sustained natural gas prices of over $6.00/MMBtu will threaten over 200,000 jobs economy wide. Natural gas pricing forecasts call for more of the same.

At the end of the day, the real environmental benefits that could be achieved by Clear Skies legislation will mean little to American manufacturers, if current energy policies continue, and more manufacturers and jobs are driven off shore because America now has the world's highest energy prices.

The Natural Gas Crisis

Last month an energy-consulting firm, Energy and Environmental Analysis, issued a report saying that, "US natural gas prices will average $6.00/MMBtu at Henry Hub through the current storage injection season."

Prices next winter will increase further, averaging $6.40 from November through March and peaking as high as $6.60 between December and February, the firm said. "Declining gas productive capacity due to the anemic drilling activity in 2002 has resulted in extremely tight market conditions," EEA said in its monthly report.

Those US prices are more than double the price of natural gas in Europe, more than triple the price in parts of Asia, and nearly ten times the price of natural gas in the Middle East, North Africa, Russia, and Venezuela.

Natural gas is a regional commodity, but industries that depend on natural gas compete in a global marketplace. The chemical industry is an example. Chemical makers use natural gas to power their plants and as a raw material that is converted into plastics, fibers and other materials that are bought and sold around the world. In recent years, when the price of natural gas was at its historic average, the chemical industry posted a $20 billion trade surplus. Today, the US is net importer of chemicals. Today, the US is the world's high cost producer of chemicals because it pays the highest prices for natural gas. With its competitive advantage gone, US chemical production capacity is being shut down and thousands of good-paying jobs are moving overseas.

What's happening to natural gas is simple—the oft proven laws of supply and demand at work. Demand for natural gas is booming and supply is declining. The gap is growing rapidly and, as a result, the price of natural gas has tripled since 1999. Compounding the problem—the inventory of natural gas is now at historic lows. These inventories are unlikely to be replenished over the summer to a level sufficient to drive down prices in the face of next winter's heating demand.

What America faces is not a seasonal disturbance, but a fundamental structural imbalance in supply and demand for natural gas. America has developed a tremendous demand for natural gas. It is clean. It is efficient. It is critical to making important products Americans use every day. And until recently, it was abundant and competitively priced.

Consumers demand it for heating their homes. Half of new homes are now heated by gas. Environmentalists demand it because it is clean burning. Industries, including the chemical industry, demand it because it is an excellent raw material for making thousands of products that we each use, every day.

More recently the electric utility sector of the US economy has turned to natural gas. Because of the low capital costs, shorter construction lead times, and environmental policies, natural gas used to generate electricity has increased by 35 percent in the past 5 years. Natural gas consumption for electricity generation is projected to increase from 5.3 trillion cubic feet in 2001 to 10.6 trillion cubic feet in 2025.

America's economy is becoming one that is increasingly reliant on natural gas.

Natural gas prices and subsequent impacts leave us with questions about how much Clear Skies will help our situation. While Clear Skies could slow the drive to natural gas for power generation, and could even promote clean coal technologies for future generating capacity, additional action is needed. Environmental policies like Clear Skies will have little bearing on businesses like ours if our operations continue to be driven off-shore by runaway energy prices.

Congress Needs to Act

Unfortunately, the nation's current natural gas supply is running low. Production capacity is lower today than it was 30 years ago when Americans were consuming far less natural gas.

The paradox is that America has adequate domestic natural gas reserves to meet current and future needs. Unfortunately, Congress won't allow access to those natural gas reserves. The most promising—and desperately needed—reserves are currently off-limits to development. Many of these reserves are in partially restricted areas like the northern Rocky Mountains, Alaska, or in fully restricted areas such as the eastern Gulf of Mexico and off the East and West Coasts.

In the final analysis, the natural gas crisis is a domestic political and public policy problem. Environmental policies are driving new demand for gas to generate electricity and heat homes. Other environmentally driven policies keep critically needed supplies off limits. As a Nation, we can't have it both ways. We can't demand more natural gas and continue to cutoff the natural gas supply.

Natural Gas Implications for the Clear Skies Act

This economic and energy context shapes how we look at environmental policies like Clear Skies. National air quality policies have sharply accelerated the switch from coal to natural gas by electricity generators. The Clear Skies proposal, in its current form, has the potential to slow the stampede from coal to gas and to partially help secure a period of more stable, diverse and sustainable supply of competitively priced energy.

Clear Skies does not go far enough, however, to promote the development and use of clean coal technologies for future generating capacity. Clear Skies largely supports the continued use of existing generating capacity with add-on technology controls, but does little to encourage the adoption of control technologies that will actually grow the use of coal in America and mitigate the demands on natural gas.

When compared to other multipollutant legislation that has been introduced, Clear Skies would best promote continued fuel diversity. Clear Skies attempts to balance the demand for continued Clean Air progress with maintaining energy diversity. The debate surrounding the introduction of Clear Skies highlights this delicate and tenuous balancing act—even minor changes to the bill could drive utilities to switch to natural gas.

Clear Skies does not put mandatory controls on CO2 emissions. If Congress does enact mandatory CO2 controls, the days of coal-fired power generation are numbered. Coal, the one domestically abundant energy source that keeps energy prices in reasonable balance will no longer be used. Natural gas prices will skyrocket with even greater demand and subsequent shortages of supply. The three-pollutant approach, described in Clear Skies with implementation carried out over a reasonable timeframe will enable utilities to make use of the latest clean coal technology and move forward with development of additional coal technologies.

The right timelines also could enable power generators to maintain their diverse fuel base, and assure market entry of advanced fossil technologies, including natural gas and coal technologies. The same holds true for timelines and stringency chosen to control mercury emissions. Too tight a timeline or too stringent mercury reduction will force utilities to fuel-switch.

Clear Skies should provide an exemption for all energy efficient and low-emitting combined heat and power (CHP) generators. Many of our member companies rely heavily on CHP systems to provide the steam and electricity for internal manufacturing processes. These systems are universally recognized as being ultra-efficient when compared to traditional fossil fueled utility power generators because they capture the heat from the electricity generation process for use in the host chemical plant. Today's systems can reach or exceed efficiencies as high as 80 percent, nearly twice that of the best combined-cycle gas fired utility generator. Obviously getting twice the energy outputs from the same energy inputs is beneficial. Congress should be encouraging greater CHP usage by commercial, industrial and residential interests.

The American Chemistry Council has not yet finalized our position on Clear Skies legislation as environmental policy. But Clear Skies also has implications on national energy policy, and in that regard, our position is clear: Clear Skies can slow the stampede in power generation from coal to natural gas and Clear Skies can help America maintain a more diverse fuel base. But Clear Skies cannot, by itself, restore balance to natural gas markets and it will not stop new generating capacity from being almost exclusively natural gas fired and increasing the price of natural gas. Last, Clear Skies alone cannot make American manufacturing more competitive and help our economy regain and maintain its strength in global markets by lowering energy prices.

Congress must open up the domestic natural gas supply and restore balance to our nation's fuel diversity. A strong long-term economy that includes an energy policy that improves the economic well being of all citizens must be coupled with the actions that lead to improved health and environment.

STATEMENT OF JOEL BLUESTEIN, PRESIDENT, ENERGY AND ENVIRONMENTAL ANALYSIS, INC.

Summary of Testimony

Natural gas prices are likely to be higher in the future than in the last 15 years and power generation is the fastest growing component of natural gas demand. New multipollutant regulations are not a primary driver for the increase in gas prices, however. In addition, higher gas prices are likely to reduce the potential for widespread switching from gas to goal as a result of increased regulation. Finally, a gradually implemented multipollutant program that rewards the development and implementation of new technology could promote a more balanced mix of power generation assets and help avoid over-reliance on gas.

Introduction

Thank you Mr. Chairman and members of the Subcommittee for the opportunity to testify today. My name is Joel Bluestein and I am the President of Energy and Environmental Analysis, Inc. EEA is located in Arlington, Virginia and has been providing energy and environmental consulting services since 1974. Among our major areas of expertise are:

- Analyzing and forecasting the supply, demand and price of natural gas
- Analyzing the impacts of regulatory policy on energy markets
- Analyzing new energy technologies in the context of environmental regulations.

We have done this work for natural gas producers, pipelines, local distribution companies, power generators, technology developers, the U.S. Department of Energy, the U.S. Environmental Protection Agency and other public, private and institutional clients. I have been at EEA for 14 years and have over 20 years of experience in the energy and environmental field.

Today I'd like to briefly share with you our current outlook on supply and price of natural gas in North America and some views on the relationship between that outlook and multipollutant legislation.

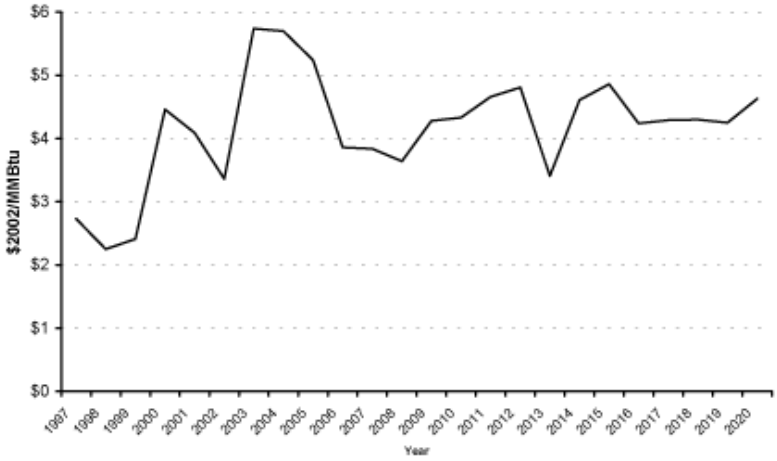
Gas Price Forecast

EEA quarterly prepares a 20 year forecast of North American natural gas supply, demand and price that we call our Natural Gas Compass. Figure 1 summarizes our current view of the price for natural gas over that period. It shows that we expect gas prices at the Henry Hub to average about $5.70/MMBtu (in constant 2002 dollars) for the next 2 years and decline to a level around $4.50/MMBtu for the remainder of the period except for brief periods later in the forecast.

This is a significant increase from gas prices over the last 15 years, which have mostly stayed below $2.50/MMBtu. The roots of this change have been quite visible in the last few years and reflect the end of the "gas bubble" of the 1990's or more precisely the fact that the balance of supply and demand for natural gas has been growing tighter in recent years. A tighter balance between supply and demand results in higher prices and increased volatility. This does not mean that we are "running out" of natural gas, it does mean that gas producers need to look further afield and spend more money to meet the demand for gas, and that is reflected in the price.

Figure 1

EEA Forecast of Natural Gas Price at Henry Hub



Our forecast includes new development of natural gas in several U.S. areas including Alaska, the deep Gulf of Mexico and the Rockies as well as imports from the Mackenzie Delta in Western Canada and the Maritimes area off of Canada's east coast. We also project increased imports of liquefied natural gas (LNG) through the four existing LNG terminals and the addition of several new LNG terminals in the later part of the forecast. Finally, we project that adequate pipeline capacity must be constructed to bring the gas to places where it is needed.

This scenario reflects what we see as a realistic though challenging period of growth for the natural gas industry. It requires very large investments of capital, though not more than has been invested in the past. It also requires a variety of positive policy decisions such as support for an Alaskan gas pipeline, development of LNG terminals, construction of other new pipelines, etc. If any of these does not occur, the price forecast is higher. One might say that there is more upside potential than downside on gas prices.

This price forecast is driven by the consumption of natural gas growing from 22.3 trillion cubic feet (Tcf) in 2002 to 28.2 Tcf in 2015 and 30.4 Tcf in 2020. The largest portion of this growth is in the power generation sector, growing from 4.3 Tcf in 2002 to 8.4 Tcf in 2015 and 9.5 Tcf in 2020. While there is some variation, these consumption projections are not significantly different from those developed by other forecasters, including the U.S. Energy Information Administration.

So I agree with the basics of much of what has been said on this topic:

- The gas supply/demand balance has gotten tighter and will remain tight.
- Gas prices will be higher than in recent history, perhaps significantly higher.
- Power generation will be the major growth sector for gas demand.

Relationship to Multipollutant Regulation

The question of how we can best and most appropriately ensure an adequate gas supply is a complex and important one that is already being addressed in other forums. I think the question for today is: "What does this gas price outlook say about environmental regulation of the power generation sector?"

The EEA forecast does not include any significant switching from coal to gas in the power generation sector. We do include the large amount of new gas-fired generation that has been built in recent years, about 150 GW from 1998 through 2002, and continued construction of new gas capacity in the near future. We also project new coal capacity coming on line, mostly after 2010.

It must be pointed out that, in certain areas, this new gas capacity actually reduces gas consumption by replacing older, less efficient gas generation. We have seen old gas plants retired in Texas because they cannot compete with the new, more efficient gas plants. It's been estimated that replacing all of the old gas plants in Texas with new, state-of-the-art gas combined cycle plants could reduce gas con-

sumption for power generation by over 200 Bcf per year. The use of even more efficient combined heat and power (CHP) can make this reduction even greater. The same is true in other parts of the Southwest, as well as parts of the West, South and Northeast. In some States where markets have not opened up yet, this potential is currently being lost because incumbent utilities can choose to dispatch their old less efficient plants rather than the new plants.

There seems to be a lot of concern that, either on its own or due to various environmental restrictions, the demand for gas for power generation will inexorably grow until it threatens our economy. I think this concern is overstated and unfounded, certainly as regards the power generation sector. Although we see continued growth in new gas-fired generation, we do not expect massive switching from coal to gas under any 3-P regulatory scenario currently being discussed.

At the gas prices we are forecasting, switching to gas will not be the most economic choice except for the least economic, highest cost-of-control coal plants. The capital cost of a new combined cycle plant is much less than a new coal plant, but still much more than the cost of even a complicated control retrofit at most coal plants. And then, the cost of fuel for even an efficient new combined cycle gas plant at $4.50/MMBtu is over $30/MWh. This is almost three times the fuel cost for even an inefficient coal plant burning coal at $1/MMBtu or less. There is a lot of money to be made on the coal side of that competition. This is reflected in the U.S.

EPA's extensive modeling of regulatory scenarios in which they are hard-pressed to show any significant switching to gas even with gas prices two or three times lower than the prices we are forecasting.

The higher gas prices go, the better the economics of coal look. We might have greater concern over switching if there were no way to burn coal efficiently and cleanly. But this is not the case. There are many coal plants today that efficiently and economically limit their SO_2 and NOx emissions and are highly competitive in the market. New coal plants being built are even cleaner. New coal technologies being developed, such as integrated gasification combined cycle plants, are cleaner and more efficient yet.

New technology is vital to addressing control additional pollutants such as mercury or even CO_2. The concern then becomes whether the appropriate technologies will be available to provide adequate reductions. In the history of pollution control programs, industry has always found ways to control pollution more effectively and less expensively than originally thought possible. But that may be little comfort to plant owners who face a new set of pollution control challenges.

Multipollutant programs like the Clear Skies Act and those proposed by Senator Jeffords and Senators Carper, Chafee and Gregg, despite differences in detail which I don't propose to address, all will likely help the development of new, clean coal generation by providing increased regulatory certainty and flexibility to find effective compliance solutions. Emission cap and trade programs provide a variety of tools to address the problem, including: the timing and stringency of the cap, cost mitigation measures and availability of off-sector trading.

One shortcoming of the Clear Skies Act in supporting new technology is that the "grandfathering" approach to allowance allocation disadvantages new plants in general and new coal plants in particular. The failure to allocate allowances to new coal plants creates a disincentive for companies to develop these plants and drives the power sector more toward gas. An allocation approach that includes new plants and rewards efficiency is one way to help ensure that we can continue to rely on our substantial coal resources.

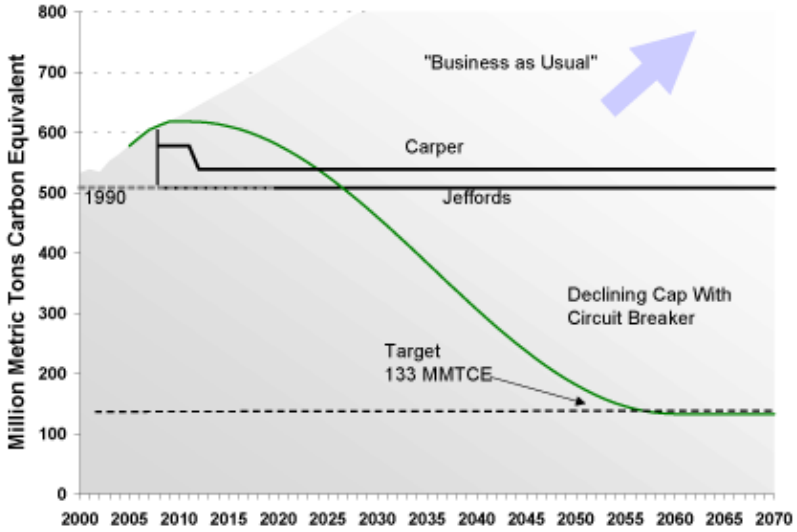
I agree with those who endorse phased implementation of emission caps. However, I would add that starting the programs earlier and phasing them in more gradually is critical to ensuring the availability of appropriate technology. Development of new technology requires a driver, which in this case is regulation. Then technology development needs money and time for research, development and commercialization. Command and control programs and cap and trade programs with large reduction steps don't provide enough time for technology development. However, delaying the imposition of the regulation doesn't provide a sufficient driver for development. A series of gradual steps can jump-start technology development and keep it moving.

This can be illustrated for the topic that probably creates the greatest concern for over-reliance on natural gas—CO_2 reduction. I think it's clear that switching to gas alone is not an adequate approach to CO_2 mitigation. CO_2 reduction will require a mix of gas, renewable, and advanced coal technologies such as integrated gasification combined cycle with sequestration or coal-based hydrogen production, combined heat and power and other efficiency measures. Overly aggressive near-term reduction requirements will not help us promote the development of new technologies. On the other hand, neither will continued delay of regulation. The point

was made at the last hearing on this topic that delay in addressing CO_2 regulation is one more reason that companies are reluctant to construct new coal capacity today. Finally, the long-term reduction goals required to address climate change are much greater than the levels currently being discussed even in 4-P legislation and must be recognized early to provide the right direction.

Figure 2 shows a cap and trade approach that applies gradual CO_2 reductions to jump-start technology development and promote long-term solutions while avoiding near-term economic distruption, including excessive switching to gas. In fact, in this approach, the emission cap increases for the first several yars, then levels off and begins a very gradual decline. It is designed to reach an 80 percent CO_2 reduction by 2060, which is calibrated to meeting a 450 part per million (pp) atmospheric CO_2 level. An economic ″circuit breaker″ could be used during the declining portion of the program to adjust the rate of decline and avoid economic disruptions.

Figure 2
Example of a Gradually Declining Cap on Carbon Emissions from the Power Generation Sector

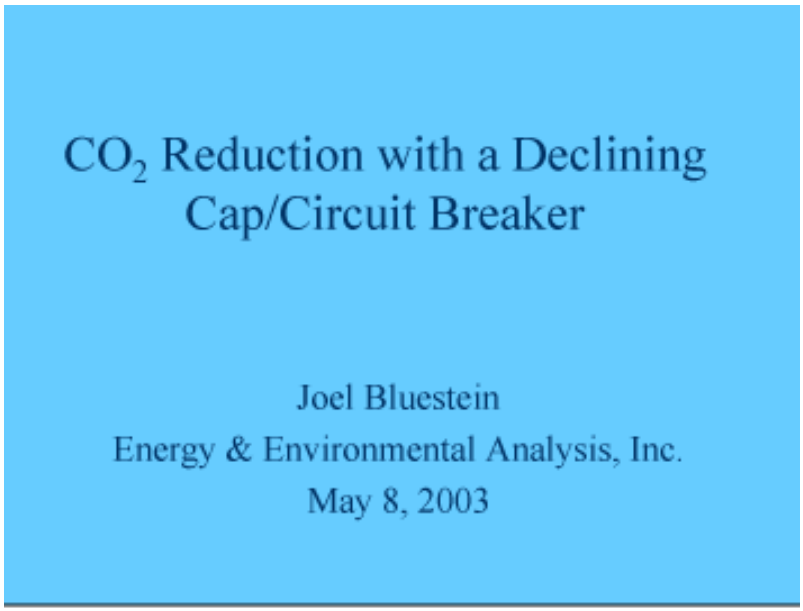


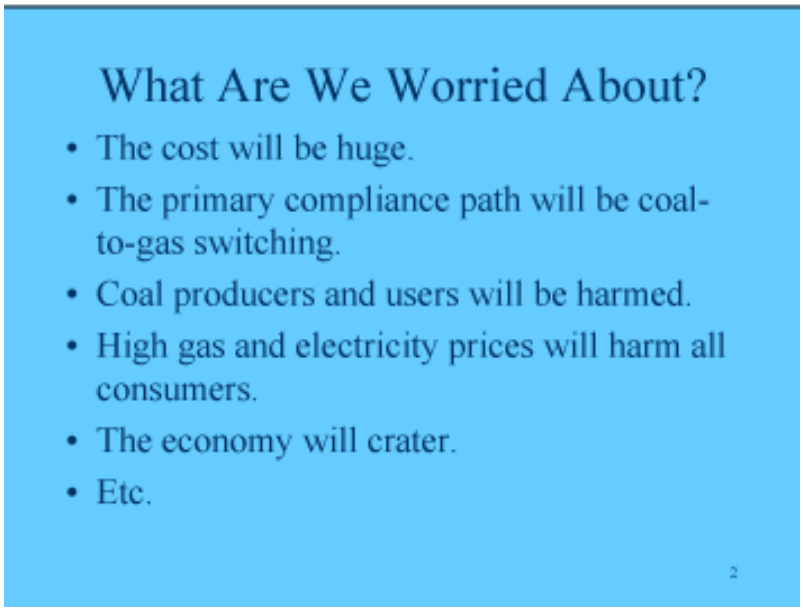
This approach would send an immediate signal that new technology is required and provide financial support for new technology through an immediate, active market in CO_2 allowances, even though reductions are not immediately required. It would provide immediate financial return for "no regrets", voluntary actions while reducing the transaction cost and verification concerns. The schedule would also avoid any immediate devaluation of existing assets, since major reductions don't start until 2015. At the same time it makes a commitment to meet the long-term goals. More information on this approach is included as Attachment A. A similar, less gradual approach could be used to promote new technology for mercury control.

Conclusion

In conclusion, we do see higher gas prices in the future, regardless of what regulations are imposed on the power generation sector. This increase and its implications need to be addressed separately from their implications on multipollutant regulation. However, higher gas prices will increase the value of new, clean, efficient coal technologies. We need to continue the use of coal as a major component of our power generating mix. However, the future of coal-based generation should not be the continued use of 50 year old plants but rather the construction of new, more advanced coal technologies. That, in fact, is probably the long-term path to wider use of coal in our economy through the development of coal-based liquid fuels or hydrogen. Multipollutant legislation can encourage the development of those technologies by providing equitable allowance allocations for new plants and by setting gradually declining emission caps from an early starting point.

Thank you again for this opportunity to speak and I'll be happy to respond to any questions at the appropriate time.





An Alternative Outlook

- Compliance will be achieved through a mix of fuels and technologies, including renewables, sequestration and advanced coal technology.
- Phased implementation will avoid stranded investments.
- The U.S. will maintain a balanced energy mix, including coal.
- Costs to industry and consumers will be minimized.

3

Principles for CO_2 Regulation

- Climate change is a long-term problem. We need to look for long-term solutions.

Renewables	Clean coal
Efficiency	Sequestration

- We need the right structure to promote these technology solutions.
- Getting started with the right structure is more important than knowing exactly where we are going.

4

The Technology Solution

- Cost-effective carbon mitigation will rely on technologies that we can't clearly foresee today.
- New technology requires:
  - A clear driver - the push has to be there.
  - Money - the capital and the market must be there.
  - Time - even then, new technology takes time.
- We need to start early with clear but gradual regulatory and economic drivers.

5

Things We Don't Know

- Will the technology work?
- How much will it cost?
- Will the market work?
- How much will the allowances cost?
- How much reduction do we need?

We can't predict for sure.

6

Some Things We Know

- Our predictions aren't very good.
- Compliance costs turn out lower than we think expect.
- The cap levels aren't low enough.
- In the end, the markets work.

But how much are we willing to bet?

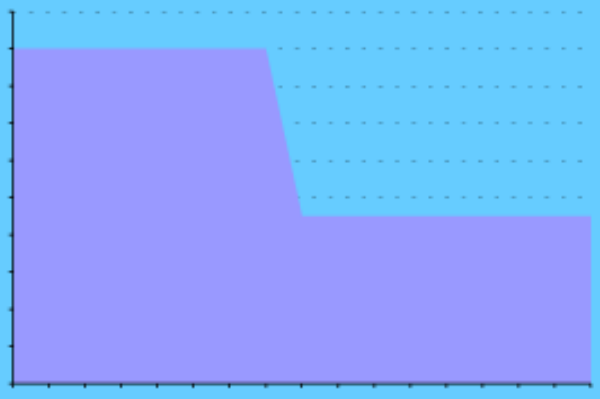
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Cap and Trade Design Toolbox

- Cap timing
- Cap level
- Cap coverage
- Allocation

8

Traditional Emission Cap Profile



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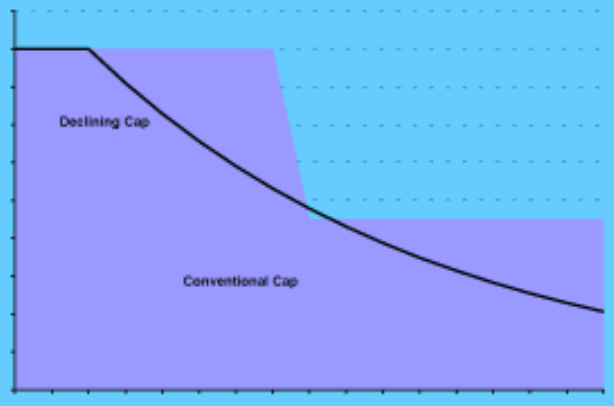
Declining Cap

The ramp, not the cliff.

- The cap decreases by a fixed percent each year. Glide slope defined in advance.
- Test the markets and technologies gradually, with low risk.
- Provide immediate price discovery and monetization.
- Provide a clear driver for new technology and long-term results.

10

Classic Declining Cap

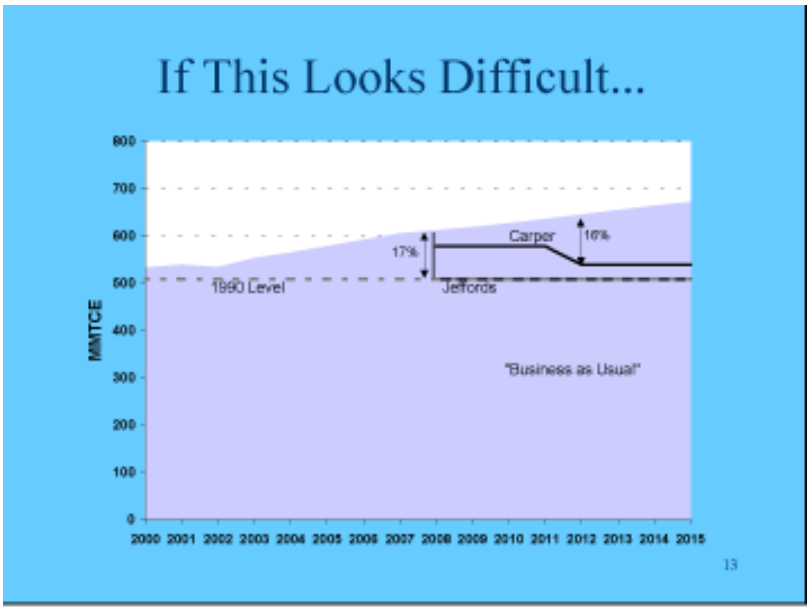


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A Workable CO_2 Cap Approach

- Near-term cap *levels* are not important.
- Implementing an immediate, gradual cap creates the driver and the economic value.
- Limit near-term risk.
- Encourage long-term technology solutions.
- Meet long-term goals.

12


If This Looks Difficult...
MMTCE
800
700
600
500
400
300
200
100
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
1990 Level
17%
Carper
16%
Jeffords
"Business as Usual"
13


The Ultimate Goal is
Even More Challenging!
MMTCE
800
700
600
500
400
300
200
100
0
2000 2005 2010 2015 2020 2025 2030 2035 2040 2045 2050 2055 2060 2065 2070
"Business as Usual"
Carper
1990
Jeffords
0.5%/yr
79% reduction
450 ppm Stabilization Goal
133 MMTCE
14

Current Approaches

- Too scary.
- Don't promote the right technology answers.
- Don't reach the goal.
- Don't provide certainty.

15

3-Step CO_2 Reduction Plan

- Phase I - 2005-2008 cap *with no reductions*
- Phase II - 2009-2012 zero growth transition period
- Phase III - very gradual reductions with economic circuit-breaker

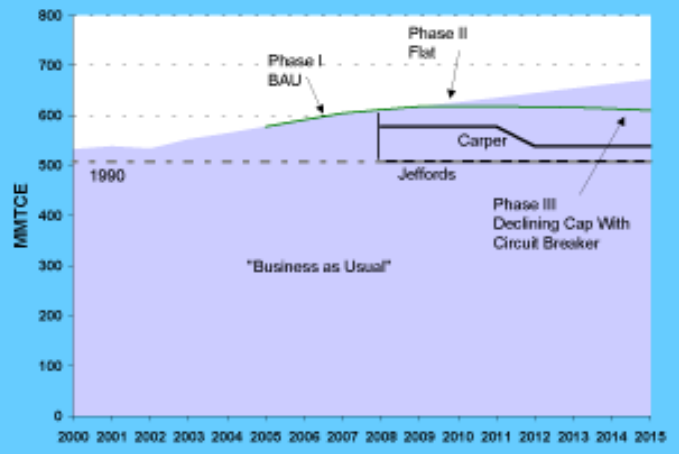
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Phase I - "immediate" cap *with no reductions*

- Cap based on "business as usual" projection.
- Does not force reductions but:
  - Creates a clear economic value for early reductions and new technology.
  - Enables verifiable "voluntary" reductions.
  - Reveals cost/value of reductions.
  - Maintains value of existing assets.
  - Avoids disruptions and uncertainty.

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Phases I and II



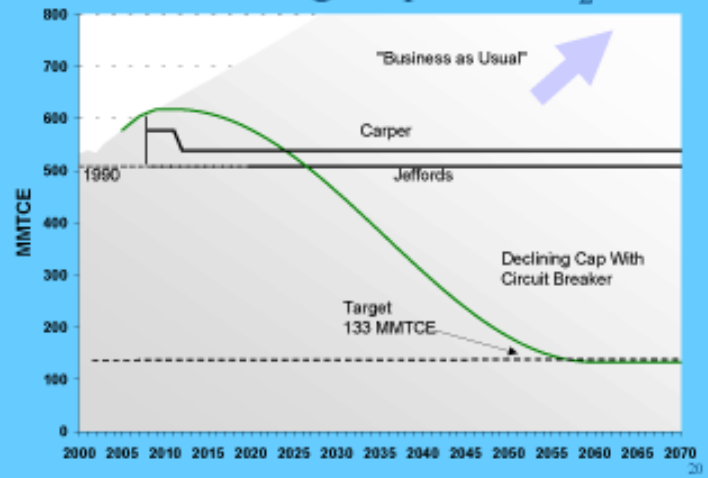
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3-Step CO_2 Plan (Cont.)

- Phase II - zero growth transition period.
- Phase III - very gradual reductions with economic circuit-breaker.
  - Sets commitment to long-term goal.
  - Provides economic driver/value for new technology.
  - Limits economic impact.

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Declining Cap for CO_2



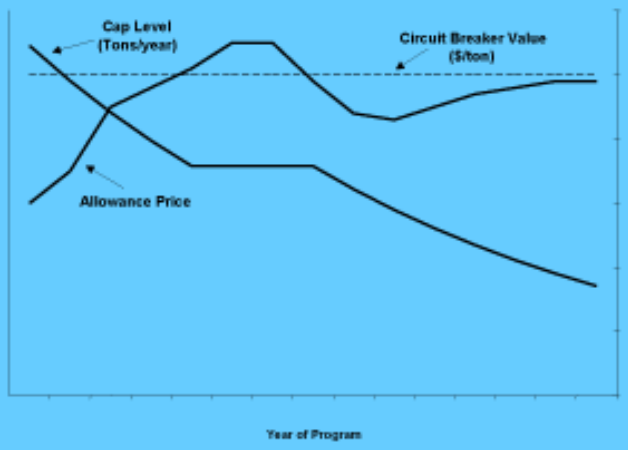
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Circuit Breaker

- Decline stops if annual average allowance cost exceeds predetermined cost threshold ($/ton).
- Decline starts again when the annual average cost is below threshold.
- Cap is never exceeded.
- Cost can exceed circuit breaker price.

21

Circuit Breaker Operation



22

Setting the Circuit Breaker

- The "correct" answer is a function of technical issues that we can't forecast.
- The acceptable answer will be:
  - What level does not disrupt the electric industry/fuel choice balance (gas/coal spread)?
  - What cost is reasonable for consumers?
- If history is a good guide, setting it too low won't be a problem.

23

Refinements

- Accelerator - converse of circuit breaker, accelerates decline if allowance price is low.
  - Probably related to new technology.
- Backstops - Reset circuit breaker if progress is stalled.

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Possible Program Parameters

- Base on electricity cost impact - say \$0.005/kWh=\$5/ton CO_2.
- Backstop - reset circuit breaker if it is tripped for 5 years straight.
- Accelerator trips if price less than 50 percent of circuit breaker for three years.

25

Allocation Approach

- Allocation does not affect cap but can promote beneficial technologies.
- Need to allocate allowances to new sources - updating
  - Then output-based allocation.
- Alternatives that provide same driver are possible.

26

Impact of Allocation

- Emission cap literally applies to combustion-based generation.
- Allocation of allowances can help encourage alternative solutions:
  - Renewable generation
  - End-use efficiency
  - Sequestration

27

Potential for Gaming

Will generators increase control cost to trigger circuit breaker?

- First incentive is to reduce generating cost, increase sales, not increase cost of allowances.
- Not clear that it is economically beneficial to purposely trigger circuit breaker - emissions still capped.
- Obvious gaming can be controlled.

28

Off-Sector Reductions

- Gradual implementation and safety value reduce need for off-sector reductions.
- Off-sector sequestration should be included.
- Off-sector reductions could be considered in the future if cost is high.
  - Must be surplus, verifiable, measurable.

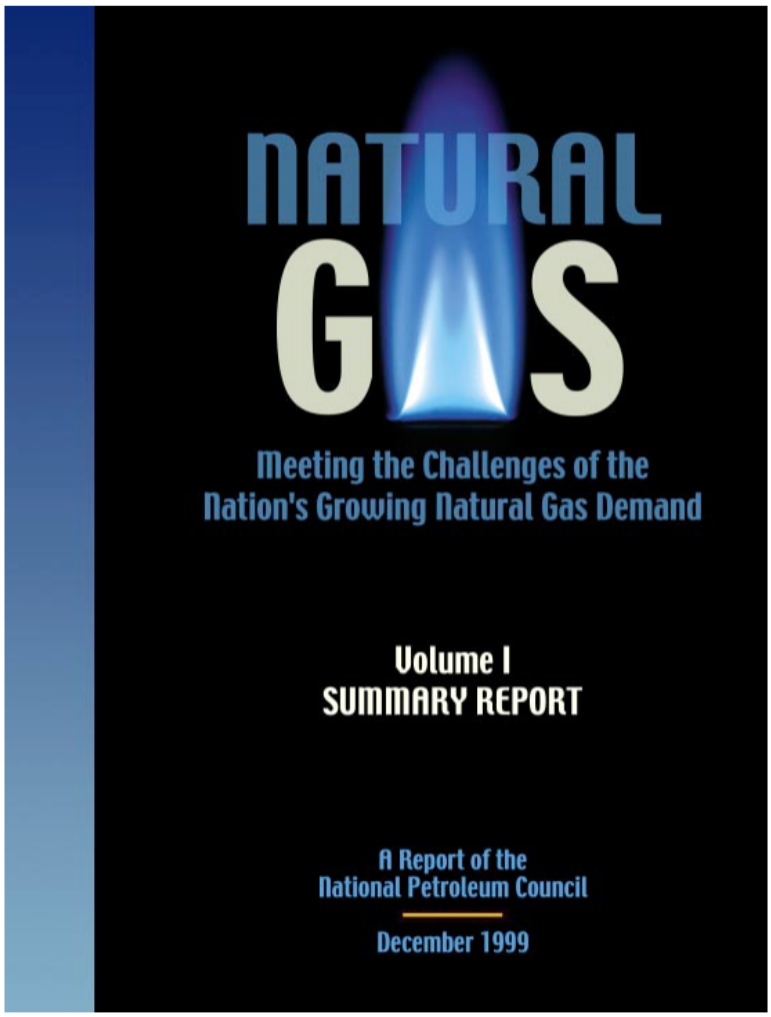
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Application to Other Sectors

- Has same limitations as other downstream cap and trade programs.
- Could be applied for large industrial/ commercial boilers.
- Possibly applicable to other homogeneous industries.

30


Benefits of Approach
• Meets long-term emission goals.
• Avoids near-term economic disruption, stranded investments.
• Promotes new technologies of all kinds.
• Better driver for balanced energy mix.
• Provides greater environmental and economic certainty
31


NATURAL
GAS
Meeting the Challenges of the
Nation's Growing Natural Gas Demand
Volume I
SUMMARY REPORT
A Report of the
National Petroleum Council
December 1999

This volume is dedicated to the memory of

Collis P. Chandler, Jr.

who passed away during the course of this study.

Collis was an independent oil and gas producer
who chaired companies
that bore his name for nearly half a century.

A former National Petroleum Council Chair,
Collis served on numerous NPC committees and subcommittees,
including the ones that prepared this volume.

Collis willingly contributed his experience,
practical insight, and friendship.

He will be missed.

NATIONAL PETROLEUM COUNCIL
An Oil and Natural Gas Advisory Committee to the Secretary of Energy

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December 15, 1999

Dear Mr. Secretary,

On behalf of the members of the National Petroleum Council, I am pleased to submit to you the results of the 1999 study on natural gas, entitled *Meeting the Challenges of the Nation's Growing Natural Gas Demand*. The objective for the study was to provide the requested advice on the potential contribution of natural gas in meeting the nation's future economic, energy, and environmental goals.

The Council is pleased to report that natural gas can make an important contribution to the nation's energy portfolio well into the twenty-first century. Demand for natural gas will continue to increase as economic growth, environmental concerns, and the restructuring of the electricity markets encourage the use of natural gas. More than 14 million new customers will be connected to natural gas supply by 2015 and many more will find their growing electricity needs met by gas-fired generators.

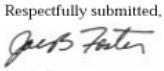
The estimated natural gas resource base is adequate to meet this increasing demand for many decades, and technological advances continue to make more of those resources technically and economically available. However, realizing the full potential for natural gas use in the United States will require focus and action on certain critical factors. These factors include:

- Access to resources and rights-of-way
- Continued technological advancements
- Financial requirements for developing new supply and infrastructure
- Availability of skilled workers
- Expansion of the U.S. drilling fleet
- Lead times for development
- Changing customer needs.

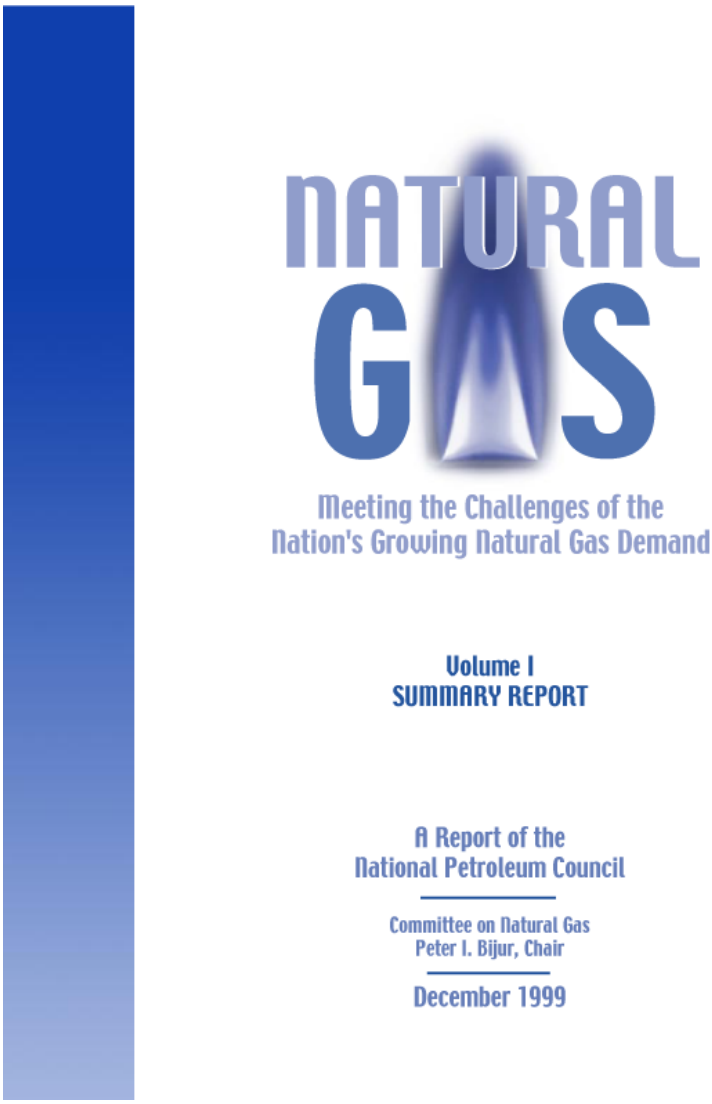
Each of these factors can be positively influenced, but government, industry, and other stakeholders must act quickly, cooperatively, and purposefully to ensure the availability of competitively priced natural gas.

The National Petroleum Council stands ready to work with government to further discuss the results of this report and to implement the recommendations in order to meet the nation's growing gas demand.

Respectfully submitted,



Joe B. Foster
NPC Chair



NATURAL GAS

Meeting the Challenges of the Nation's Growing Natural Gas Demand

Volume I
SUMMARY REPORT

A Report of the
National Petroleum Council

Committee on Natural Gas
Peter I. Bijur, Chair

December 1999

NATIONAL PETROLEUM COUNCIL

Joe B. Foster, *Chair*
Archie W. Dunham, *Vice Chair*
Marshall W. Nichols, *Executive Director*

U.S. DEPARTMENT OF ENERGY

Bill Richardson, *Secretary*

The National Petroleum Council is a federal advisory committee to the Secretary of Energy.

The sole purpose of the National Petroleum Council is to advise, inform, and make recommendations to the Secretary of Energy on any matter requested by the Secretary relating to oil and natural gas or to the oil and gas industries.

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Foreword

The National Petroleum Council is pleased to report to the Secretary of Energy that, given immediate focus on key issues, natural gas can make an important contribution to the nation's increasing energy needs and its environmental goals through 2015 and beyond. The natural gas industry has evolved into a competitive industry offering its expanding and reliable services on a nationwide basis. Between 1990—the reference point for the 1992 NPC report—and 1998, total U.S. gas consumption grew from 19.3 trillion cubic feet (TCF) to an estimated 22 TCF and continues to represent approximately a quarter of the nation's fuel needs. Using the study methods described in this report, the Council concludes that gas demand is likely to increase to 29 TCF in 2010 and could increase beyond 31 TCF in 2015. Further, the resource base exists to support the indicated levels of future demand and adequate gas supplies can potentially be produced to meet that market. The additional supply required can be brought to market at competitive prices through an expanded network of pipeline, storage, and distribution facilities. However, the Council recognizes that meeting the significant challenges that accompany such vigorous market growth will require strenuous effort by the industry and substantial support on key issues by the government.

The initial impetus for the current study (hereinafter referred to as "the 1999 Study") came from a letter dated May 6, 1998, in which then-U.S. Energy Secretary Federico Peña requested the National Petroleum Council to:

> Reassess its 1992 report [*Potential for Natural Gas in the United States*] taking into account the past five years' experience and evolving market conditions that will affect the potential for natural gas in the United States to 2020 and beyond. Of particular interest is the Council's advice on areas of Government policy and action that would enable natural gas to realize its potential contribution toward our shared economic, energy, and environmental goals.

In making his request, the Secretary noted that "at least two major forces … are beginning to take shape which will profoundly affect energy choices in the future – the restructuring of electricity markets and growing concerns about the potentially adverse consequences that using higher carbon-content fuels may have on global climate change and regional air quality." Further, the Secretary stated that "For a secure energy future, Government and private sector decision makers need to be confident that industry has the capability to meet potentially significant increases in future natural gas demand." (See Appendix A for this letter and

Secretary Bill Richardson's follow-up letter expressing his interest in receiving the Council's advice on these matters.)

To respond to this request, the Council established a Committee on Natural Gas under the Chairmanship of Peter I. Bijur, Chairman of the Board and Chief Executive Officer, Texaco Inc. T. J. Glauthier, Deputy Secretary of Energy, served as the Committee's Government Cochair, with H. Leighton Steward, Vice Chairman of the Board, Burlington Resources, Inc., and William A. Wise, President and Chief Executive Officer, El Paso Energy Corp., serving as Vice Chairs for Supply and for Transmission & Distribution, respectively. The Committee was assisted by a Coordinating Subcommittee, chaired by Rebecca B. Roberts, Strategic Partner, Global Alignment, Texaco Inc., with Robert S. Kripowicz, Principal Deputy Assistant Secretary, Fossil Energy, U.S. Department of Energy, serving as Government Cochair. (Appendix B contains the Committee roster along with the rosters of its Coordinating Subcommittee and three Task Groups on Demand, Supply, and Transmission & Distribution.)

Key Differences from 1992

The Secretary was correct in noting that the U.S. energy markets have changed significantly since the 1992 NPC study on natural gas (hereinafter referred to as "the 1992 Study"). The U.S. economy is growing more rapidly than was anticipated in 1992, and with that growth has come a higher natural gas demand than was expected. Environmental regulations that favor natural gas consumption are more firmly in place than in 1992 and environmental restrictions on fossil fuel-burning facilities are increasingly stringent. In fact, gas demand has grown at a rate that exceeds even the most robust scenario projected in the 1992 Study. Continued economic growth as well as concerns about air quality and climate change favor the continued expansion of natural gas demand.

Since 1992, the gas industry has undergone a significant restructuring. The primary impetus came from Federal Energy Regulatory Commission (FERC) regulations, which over time have converted interstate pipelines from sellers and transporters of natural gas to solely transporters. State regulators and local distribution companies (LDCs) are moving toward a similar result in many jurisdictions. This restructuring has driven changes in roles and risks for industry participants because a number of market functions and obligations formerly managed under the auspices of the LDCs and pipelines must now be accepted and carried out by other market participants. Since the 1992 Study, new market structures—market hubs/centers, futures trading for natural gas, and a capacity release market (a secondary pipeline capacity market)—have either developed or matured. Other financial tools have been developed to reduce the risk of price change to buyers and sellers over extended time periods. In short, the gas market has become highly efficient and sophisticated, with numerous participants ensuring competitive prices. Increased confidence in the functionality of the gas market and in competitive gas prices has played a significant role in increasing gas demand.

The industry has benefited from remarkable progress in technology in areas that were not fully anticipated in 1992. For example, three-dimensional (3D) imaging now allows scientists to virtually "see" underground rock formations in graphic detail and to reduce drilling risk by more accurately predicting locations for hydrocarbon deposits. Progress in 3D and 4D seismic technology, in conjunction with imaging technology, has allowed producers to spot small hydrocarbon accumulations. Improved drilling techniques enable production companies to more precisely hit drilling targets and accomplish difficult maneuvers such as drilling a vertical well, turning a corner, and then drilling horizontally over five miles. New technology now allows producers to access supply in ocean waters that are more than a mile deep. These improvements, along with many more, have resulted in significant reserve additions and prospects of new production in areas that were once considered physically or economically unreachable.

Technological progress has also been evident in the transmission and distribution segments of the industry and has contributed to a steady and significant decline in transmission and distribution charges since the mid-1980s. Technological advances have taken place in areas such as gas measurement, pipeline mon-

itoring, compression, and storage management. The dramatic improvements in information and communications technology have contributed to more efficient data management systems that support marketing activities and capacity scheduling. New end-use gas technologies, such as higher efficiency residential furnaces, natural gas cooling, and combined cycle power plants, continue to offer consumers higher efficiency, lower costs, and cleaner energy.

Although market confidence has grown and technology has improved the state of the industry, recent events have led to questions about the industry's ability to meet the demand growth potential. The downturn in world oil prices between late 1997 and early 1999 dealt a heavy blow to the exploration and production sectors of the U.S. gas industry, particularly to the oilfield supply/service contractors and the independent producers who supply over half of the nation's natural gas needs. Industry participants experienced an extended period of poor economic returns and, fearing a repeat of the 1984–89 depression in the industry, responded with significant downsizing and cutbacks in spending. Investment capital for developing new production, which for most industry participants is highly dependent on cash flow from crude oil and gas sales, declined dramatically in 1999. As a result, new supply development in the United States has slowed considerably. Although oil prices have now rebounded, these events have highlighted the boom and bust nature of the business and have made industry participants and investors very cautious.

Several other trends highlight the challenges that could impact the future of gas production and delivery. The broadening and extension of moratoria have reduced access to a portion of the nation's natural gas resource base. The economic hardship experienced by the oilfield supply/service sector has limited construction of rigs and other infrastructure, giving rise to questions on the industry's ability to respond to future drilling needs. Decreased spending on research and development raises concerns regarding future technological breakthroughs. Continued cutbacks and layoffs impair the industry's ability to attract new employees.

While these issues are significant, the Council wishes to emphasize that the industry has successfully met difficult challenges in the past and has proved to be resilient and resourceful. Each of the challenges identified in this study can be met if immediate, cooperative, and focused actions are taken by the industry and the government.

Approach to the 1999 Study

In conducting the 1999 Study, the NPC Committee on Natural Gas and its Coordinating Subcommittee and three Task Groups developed projections for gas demand, gas supply, and transmission and distribution. The primary focus of the 1999 Study was to test supply and delivery systems against significantly increased demand. As in the case of the 1992 Study, the Committee on Natural Gas selected Energy and Environmental Analysis, Inc. (EEA) to run econometric models for the analysis. The Coordinating Subcommittee and its Task Groups provided data and assumptions to EEA for inclusion in the development of a Reference Case for the focus period of 1999 to 2010. The assumptions used in the Reference Case represent a plausible view of the future and were selected with full understanding that, in reality, each could vary significantly. Each of the Task Groups developed sensitivity analyses to test the Reference Case through 2010 and to develop an extended view through 2015. The results of the Reference Case and the sensitivity analyses form a framework for better understanding the factors that influence supply and demand balances. This approach was particularly useful in exploring the potential range of outcomes beyond 2010, a point at which uncertainties in assumptions begin to escalate. Throughout this report, data are reported for the focus period of 1999 to 2010, with an extended view for the more uncertain period of 2011 through 2015. While the study did not attempt to model supply and demand beyond 2015, the issue of long-term sustainability is addressed.

The study participants focused on the broader industry implications and dynamics indicated by the data rather than attempt to forecast specific end results. Issues such as new regulations for climate change were not examined in detail, but other factors that

increase demand were specifically analyzed and some correlations can be made. Changes that are occurring in the areas of electricity generation, such as distributed generation, were not studied, but the overall impact of increases in gas demand due to electricity generation was examined.

Results of the 1999 Study are presented in a three-volume report as follows:

- Volume I, *Summary Report*, provides conclusions and recommendations on the potential contribution of natural gas in meeting the nation's growing demand for energy in the residential, commercial, industrial, and electric power generation sectors. Also included are summaries of key findings from the study's three Task Groups: Demand, Supply, and Transmission & Distribution. Volume I can be viewed and downloaded from the NPC web site, http://www.npc.org.

- Volume II, *Task Group Reports*, contains the results of the analyses conducted by the three Task Groups and provides further supporting details for the conclusions, recommendations, and findings presented in Volume I.

- Volume III, *Appendices*, includes output of the study's computer modeling activities as well as various source and reference materials developed for or utilized by the Task Groups in the course of their analyses. The Council believes that these materials will be of interest to the readers of the report and will help them better understand the results. The members of the National Petroleum Council were not asked to endorse or approve all of the statements and conclusions contained in Volume III but, rather, to approve the publication of these materials as working papers of the study.

  Enclosed with Volume III is a CD-ROM containing further model output on a regional basis. The CD also contains digitized maps, which were used in assessing a key critical factor—access to resources and rights-of-way. These maps provide a comprehensive inventory of acreage by land-use categories associated with related USGS gas plays for the several key Rocky Mountain resource areas analyzed in the 1999 NPC Study.

An outline of the full report and a form for ordering additional copies can be found in the back of this volume.

The National Petroleum Council believes that the results of the 1999 Study are amply supported by the rigorous analyses conducted by the Committee on Natural Gas and its subgroups. Further, the Council wishes to emphasize that the significant growth in demand that is projected in this study is based on long-term trends and should not be interpreted as a "goal" of the industry. However, as natural gas demand continues to expand, the natural gas industry stands ready to work with all stakeholders to economically develop the natural gas resources and infrastructure necessary for continuing the nation's economic growth and meeting its environmental goals.



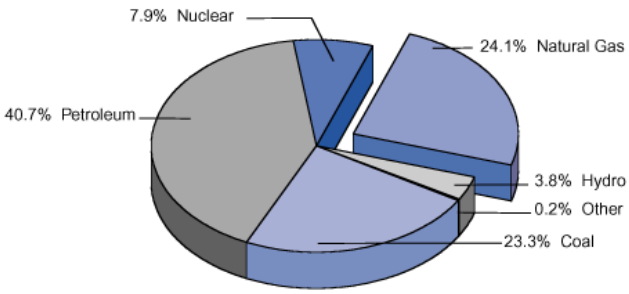
Conclusions

The emphasis on natural gas is good news for the economy, the environment, and society as a whole. In recent years, the United States has enjoyed a thriving economy, which has been driven in part by the ready availability of energy at competitive prices. Natural gas has played a vital role in meeting those energy requirements and today provides almost a quarter of the nation's energy portfolio (Figure 1). As this study demonstrates, natural gas can be a growing source of energy to power our economy for many years to come.

Actual U.S. gas demand has outpaced the 1992 Study High Reference Case projection by more than 1 TCF over the period from 1990 through 1998 (Figure 2). The 1999 Study projects that U.S. gas demand will grow from 22 TCF (including net storage fill) in 1998 to approximately 29 TCF in 2010 and could rise beyond 31 TCF in 2015. Each key consumption sector—residential, commercial, industrial, and electricity generation—will increase (Figure 3a). However, the electricity generation sector alone will account for almost 50% of the increase through 2010 (Figure 3b). Over 110 gigawatts of new gas-fired generation capacity is projected to be in service by 2010, and a total of 140 gigawatts by 2015. Natural gas is now the preferred fuel for new electricity generation facilities, with 98% of the nearly 250 recently announced new generation projects planning to burn natural gas. This dramatic shift to natural gas is driven by improved efficiencies, lower capital costs, reduced construction time, more expeditious permitting of natural gas-burning facilities, and environmental compliance advantages. However, the service requirements and price sensitivity of this additional load present many challenges to suppliers and transporters of natural gas.

Growth in gas demand will remain subject to changes in such key variables as growth in the economy, price of competing fuels, nuclear retirements, and the capacity utilization of coal-fired electricity generation plants. For example, if 30 gigawatts of nuclear capacity are retired rather than the 15 gigawatts assumed in the Reference Case, demand could increase another 0.7 TCF. If coal capacity utilization remains at current levels instead of increasing from 64% to 75% as assumed in the Reference Case, demand could rise as much as 1.7 TCF. New environmental regulations, beyond those that are currently scheduled for implementation, have not been factored into this analysis and could also further increase natural gas demand. While this study did not attempt to quantify the impacts of additional environmental regulations on demand, incremental increases from Kyoto-related regulation were estimated in independent studies at 2–12% by the Energy Information Administration and 10–22% by the Edison Electric Institute beyond their respective reference cases.

Figure 1. Total U.S. Energy Consumption by Primary Energy Source, 1998



• Natural gas supplies almost a quarter of the nation's energy needs.

Source: DOE/EIA, *Monthly Energy Review*, September 1999.

The role that natural gas plays in improving the nation's environment has been widely recognized. A recent Minerals Management Service (MMS) report, *OCS Resource Management and Sustainable Development* (September l999), pointed out the benefits of natural gas:

> Natural gas is the least polluting fossil fuel. It is thought by many, including the present administration, to be the fuel of the early part of the next century that will power our economy into the sustainable fuels of the later decades and beyond. Even in the short run, conversion of more of our fuel burning facilities to natural gas will greatly diminish air pollution and improve the long run sustainability of forests, waters, and farmlands now being negatively affected by acid deposition.

The MMS report also noted the following regarding income from offshore resources:

> …royalties and taxes enable government to carry on programs which are beneficial to the oil and gas industry as well as society as a whole. For example, an average of 60 percent of the collections from Federal offshore sources [$126 billion since offshore leasing began in 1953] went into the U.S. Treasury General Fund. Among other expenditures the Government uses a portion of these funds to invest in social infrastructure, which helps make the U.S. economy one of the most productive in the world. One of the

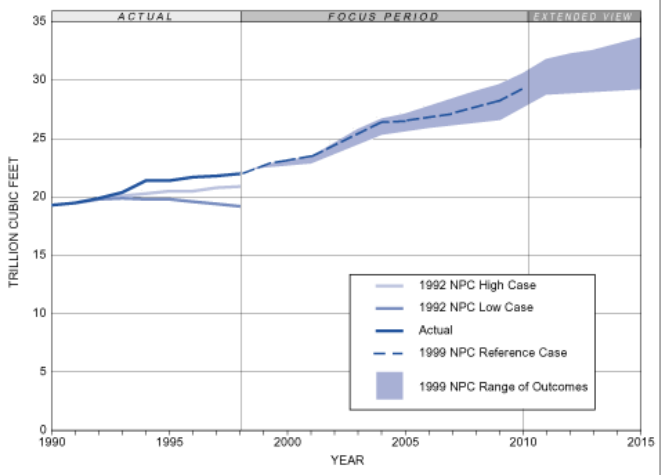
areas in which some of this money is invested is in renewable energy, including many forms of energy conservation.

In onshore areas, federal, state, and local governments receive royalty income and collect taxes from natural gas production. The revenues that are collected from these sources allow these entities to provide essential services expected by their citizens, such as funding for education.

This study estimates the U.S. natural gas resource base, excluding Alaska, to be 1,466

Figure 2. U.S. Natural Gas Demand

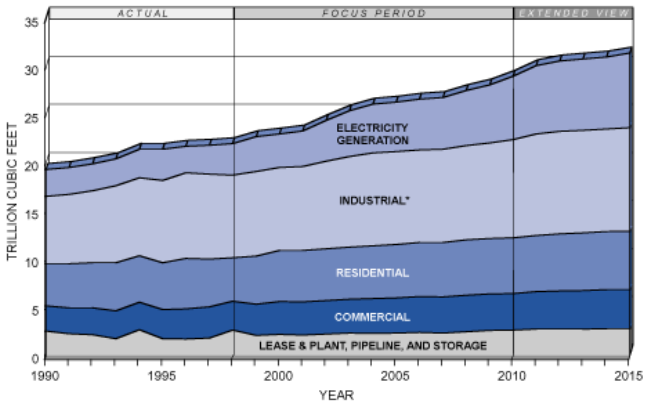
Comparison of 1992 and 1999 NPC Study Results



- Demand has exceeded the 1992 high case projection.
- Demand growth is expected to increase to 29 TCF by 2010, and increase beyond 31 TCF by 2015.
- Additional 7 TCF/year of gas supply will be needed by 2010.

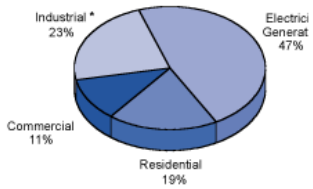
Source of historical data: DOE/EIA, *Natural Gas Monthly*, September 1999.

Figure 3a. U.S. Natural Gas Demand by Sector



- Demand will grow in all sectors.
- Almost 50% of demand growth will be due to electricity generation.

Figure 3b. Growth in Reference Case Demand, 1998—2010
(Distribution of 7 TCF Increase by Sector)



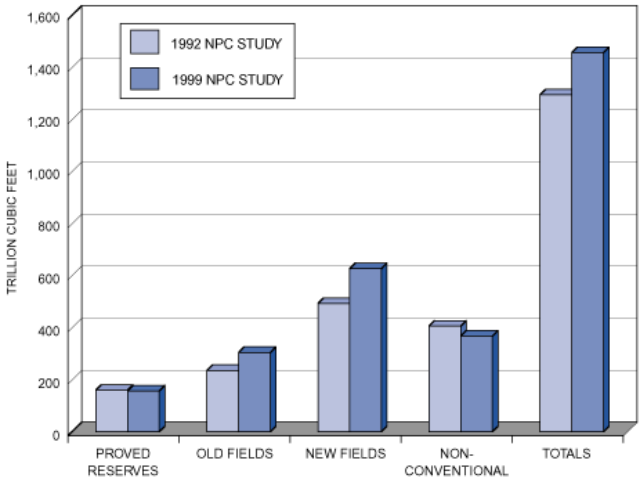
** Historical data include all gas use for industrial cogeneration and independent power producers; all gas for new power plants except cogeneration is included in the electricity generation sector.*

Source: DOE/EIA, *Natural Gas Monthly,* September 1999.

TCF (Figure 4). This total represents a net increase of 171 TCF over the 1,295 TCF estimated in the 1992 Study. Taking into account the 124 TCF that has been produced in the lower-48 states since then, the estimate of the resource base has increased 23% since the last study. The increase is largely due to technology breakthroughs that have opened new frontiers such as the deepwater Gulf of Mexico and have provided improved information and better tools for evaluating—and more fully recovering—resources.

U.S. gas demand will be filled with U.S. production, along with increasing volumes from Canada and a small, but growing, contribution from liquefied natural gas (LNG)

Figure 4. Lower-48 Natural Gas
Resource Base Estimates
Comparison of 1992 and 1999 NPC Study Results



- Estimate of remaining resource base has grown 171 TCF to 1,466 TCF.
- Resource base estimate increased 23%, considering 124 TCF of production.
- Growth is primarily from New Fields, especially in deep water.

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imports (Figure 5a). Two regions—deepwater Gulf of Mexico and the Rockies—will contribute most significantly to the new supply (Figure 5b). U.S. production is projected to increase from 19 TCF in 1998 to 25 TCF in 2010, and could approach 27 TCF in 2015. Deeper wells, deeper water, and nonconventional sources will be key to future supply. For example, deepwater production (water depths greater than 200 meters), which in 1998 provided 0.8 TCF annually, will increase to over 4.5 TCF in 2010 (Figure 6). Onshore production from nonconventional formations is projected to increase by 50% from 4.4 TCF in 1998 to almost 7 TCF in 2010, with much of it coming from the Rocky Mountain region. By 2015, nonconventional gas production could be approaching 9 TCF. Production is likely to decrease in more traditional areas such as the Gulf of Mexico shelf and onshore Louisiana, each dropping by roughly one-third by 2015. It is important to note that approximately 14% of current natural gas supply is "associated," meaning that it is produced from oil wells. This associated gas will continue to be an important component of the overall supply, particularly in deepwater Gulf of Mexico.

Imports from Canada are projected to increase from 3 TCF in 1998 to almost 4 TCF by 2010, continuing to represent 13–14% of U.S. demand. Canada's remaining resource base is estimated at approximately 670 TCF in this study, down from 740 TCF in 1992. The decrease in the estimated Canadian resource base is due to depletion and reassessment of the nonconventional resources. Challenges similar to those confronting the U.S. industry will be faced by the Canadian producers, compounded by the fact that much of this gas is in frontier areas such as the Mackenzie Delta in far northwest Canada. Reaching this frontier will require significant capital expenditures as well as considerable lead times. Continued cooperation between the United States and Canada will be essential to ensure the timely availability of Canadian gas.

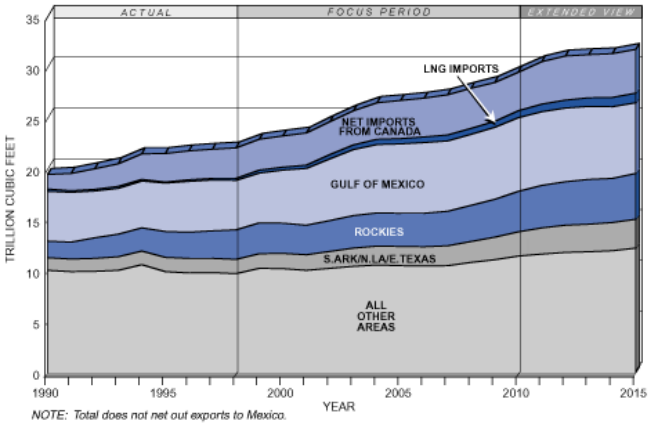
LNG imports are projected to reach a maximum of approximately 0.9 TCF, based on a 75% average capacity utilization rate for existing facilities. The assumption was made that no additional LNG import facilities would be built in the 1999–2015 period. Also, the assumption was made that exports to Mexico would reach a maximum of 0.4 TCF to serve Mexico's gas demand near the U.S. border.

The infrastructure required to deliver gas to market must be optimized and expanded to accommodate the increase in demand as well as the changing logistics of getting new supply to new customers. Future needs include new pipelines to reach supplies in the frontier regions, expansion of existing pipeline systems, new laterals to serve electricity plants, and expansion and construction of storage facilities to meet seasonal and peak-day requirements. By 2015, more than 14 million new customers will be added to the natural gas delivery system. To serve this growing market through 2015, over 38,000 miles of new transmission line are projected to be needed as well as 263,000 miles of distribution mains and almost 0.8 TCF of new working gas storage capacity.

The current delivery system (transmission, distribution, and storage) was built and optimized over decades to meet the design peak-day requirements of firm service customers that were primarily residential, commercial, and to a lesser extent, industrial customers. The anticipated growth in electricity generation demand for natural gas will require the delivery system to be re-optimized to meet larger off-peak swing loads as well as peak-day requirements that will increase from 111 BCF per day in 1997 to over 152 BCF per day in 2015. Meeting requirements of the electricity generators on a significantly larger scale will entail changes in operational procedures, communications, tariffs, and contracting. Further, these changes must be accomplished without degrading the historically reliable service to the residential, commercial, and industrial markets.

The Council believes that an unprecedented and cooperative effort among industry, government, and other stakeholders will be required to develop production from new and existing fields and build infrastructure at sufficient rates to meet the high level of demand indicated in this study. The ability to meet the anticipated demand hinges on addressing the following critical factors: access, technology, financial requirements, skilled workers, drilling rigs, lead times, and changes in customer requirements.

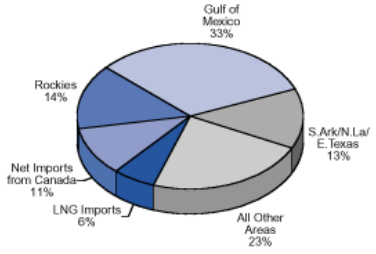
Figure 5a. U.S. Natural Gas Supply by Source



NOTE: Total does not net out exports to Mexico.

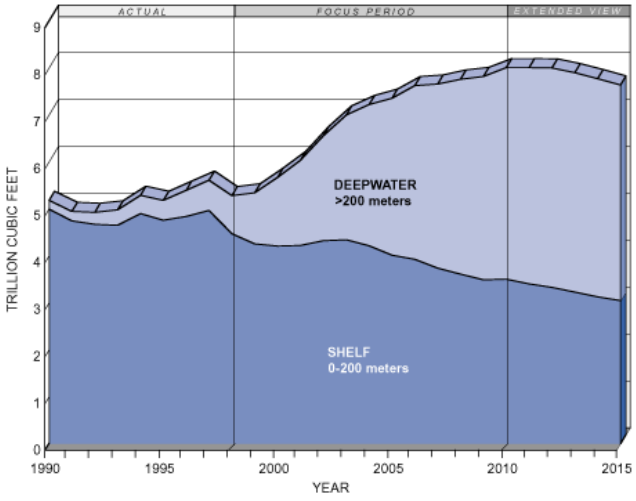
- Natural gas demand will be met primarily with domestic resources.
- Highest growth in U.S. production will be from Gulf of Mexico and Rockies.
- Canada will continue to be an important source of supply.

Figure 5b. Growth in Reference Case Supply, 1998—2010
(Distribution of 7 TCF Increase by Source)



Source of historical data: DOE/EIA, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves Annual Reports*, 1990–1997.

Figure 6. U.S. Gulf of Mexico Natural Gas Production



- Gulf of Mexico production increases by 2.7 TCF by 2010.
- Deepwater production increases from less than 1 to over 4.5 TCF/year.
- Gradual decline is projected for shelf production.

Source of historical data: PI/Dwights production reports, June 1999.

Critical Factors

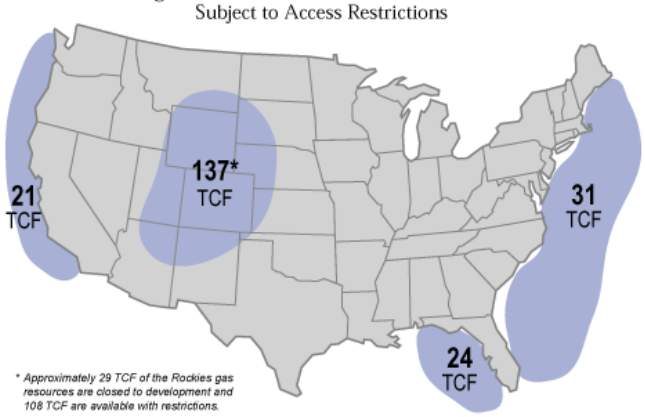
Access

Much of the nation's resource base resides on federal lands or in federal waters, yet a large portion of this resource base is not open to either assessment or development (Figure 7). Two of the most promising regions for future gas production, the Rocky Mountains and the Gulf of Mexico, currently have significant access restrictions. For example, an estimated 40%—or 137 TCF—of potential gas resource in the Rockies is on federal

land that is either closed to exploration or is open under restrictive provisions. Another 76 TCF of resources are estimated for restricted offshore areas in the eastern Gulf of Mexico, the Atlantic, and the Pacific. The eastern Gulf of Mexico is largely closed to exploration and the limited areas that are now open are the subject of political debate. The proposed MMS Lease Sale 181 scheduled for December 2001 in the eastern Gulf of Mexico is the first such sale in this area since the late 1980s, yet only covers a small portion of the entire area. The East Coast of the United States is completely closed to development while Canada is pursuing its East Coast gas resources, as demonstrated by the recent Sable Island development off the coast of Nova Scotia. In addition, drilling on the West Coast of the United States also faces strong restrictions, while offshore British Columbia is opening up to greater exploration and production.

This study assumes that planned lease sales for areas in the Outer Continental Shelf (OCS) will continue on schedule and that further restrictions will not be applied to those lands currently open to development. These assumptions may be optimistic in light of recent statements by some public officials. Further restrictions would increase the challenge of meeting the projected gas demand with cost-competitive supply. Conversely, opening hydrocarbon-rich areas for development would greatly improve the industry's potential to respond to market needs.

Figure 7. Lower-48 Natural Gas Resources Subject to Access Restrictions



- Significant amount of resource is subject to access restrictions.
- These areas are close to large and growing population centers.

Access is also an issue for the transmission and distribution sectors of the industry as they seek rights-of-way for pipeline facilities. The permitting and construction processes have become more complex over time. Restrictions for wetlands, wildlife refuges, and other sensitive federal and state lands impact the routing and construction of pipelines throughout the United States, not just the frontier areas. Other issues arise from the encroachment of urban development on existing rights-of-way, heightened community awareness of and resistance to pipeline construction, and increasingly restrictive government policies and regulations. Resolution of these issues—which must be addressed for each pipeline addition—is costly and time-consuming and often results in project delays or abandonment of projects.

Most of the access restrictions are due to environmental concerns or multiple-use conflicts even though industry has made tremendous improvements in reducing the "footprint" of exploration, production, and transportation activities, and in maintaining clean, safe operations. As stated in a recent Department of Energy report, "Resources underlying arctic regions, coastal and deep offshore waters, sensitive wetlands and wildlife habitats, public lands, and even cities and airports can now be contacted and produced without disrupting surface features above them."[1] An excellent example of the dramatic improvements in environmental footprints can be found in Alaska where significant efforts have been made to minimize the impact of drilling operations on the tundra. A report to the Secretary of the Interior in 1997 by the Alaska Oil and Gas Association stated that in the 1970s, pads for drilling operations took up about 65 acres whereas the pads for recent operations are now less than 10 acres. The report further explained that cluster drilling and extended reach drilling enable producers to access hydrocarbon deposits 3–4 miles away from the pad, thus greatly reducing the number of drilling locations and associated roads and pipelines. Lateral extensions of 18,000 feet are common on the Alaskan North Slope today. More recent efforts in other parts of the world have extended the drilling reach to 5–6 miles. This has the same effect as setting up drilling operations on the White House lawn and extracting hydrocarbons from beneath most of Washington, D.C., and into its suburbs (Figure 8).

Equally impressive improvements in environmental impacts have been demonstrated offshore, where much of the natural gas production is associated with oil production. As reported to President Clinton by the Cabinet in *Turning to the Sea: America's Ocean Future* (September 1999), "Advances in technology have made offshore oil and gas production cleaner and safer than ever. Since 1980, 6.9 billion barrels of Outer Continental Shelf oil have been produced with a spillage rate of less than 0.001%. Despite these advances, however, environmental concerns have led to congressional and executive moratoria since 1981, and many of our coastal areas are now closed to new leasing through the year 2012."

This study has determined that access issues, and associated environmental concerns, must be addressed. Access to some portion of the federal gas resource base currently closed or significantly restricted to appraisal or development, as well as acquisition of rights-of-way, is essential to meeting the projected demand with cost-competitive gas supply.

Technology

Even though the estimated resource base is adequate to last many decades, technological challenges and the degree of difficulty in reaching, evaluating, and producing the resource base continue to escalate. The previously referenced report by the Office of Fossil Energy of the U.S. Department of Energy[2] highlights the importance of research and development to the oil and gas industry:

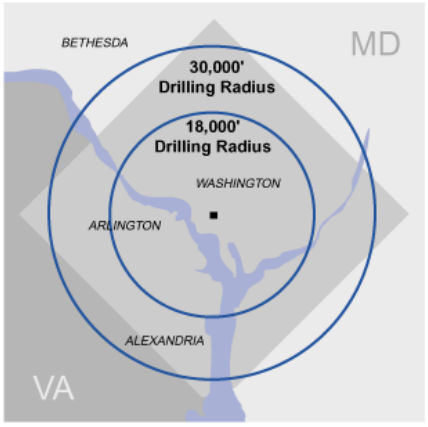
> In the past three decades, the petroleum business has transformed itself into a high-technology industry. Dramatic advances in technology for exploration, drilling and completion, production, and

[1] U.S. Department of Energy, Office of Fossil Energy, *Environmental Benefits of Advanced Oil and Gas Exploration and Production Technology*, October 1999, pg. 13.

[2] Ibid, p.1.

site restoration have enabled the industry to keep up with the ever-increasing demand for reliable supplies of oil and natural gas at reasonable prices. The productivity gains and cost reductions attributable to these advances have been widely described and broadly recognized... Looking forward, the domestic oil and gas industry will be challenged to continue extending the frontiers of technology. Ongoing advances in E&P productivity are essential if producers are to keep pace with steadily growing demand for oil and gas, both in the United States and worldwide. Continuing innovation will also be needed to sustain the industry's leadership in the intensely competitive international arena, and to retain high-paying oil and gas industry jobs at home. Progressively cleaner, less intrusive, and more efficient technology will be instrumental in enhancing environmental protection in the future.

Figure 8. Reducing Environmental Impact with Extended-Reach Drilling



- Improvements in extended-reach drilling allow access to resources 5 to 6 miles from the drilling site.
- Similar technologies for minimizing environmental impact continue to be developed.

Technology improvements are particularly important given the more difficult conditions accompanying new resources. Deeper wells encounter extreme temperatures and pressures and increased potential for intensely corrosive environments. These conditions require high-strength materials and advanced drilling methods. Current deepwater endeavors involve exploration wells in over 8,000 feet of water and complex production projects in more than 5,000 feet of water. Subsea pipelines must be built to withstand powerful currents, shifting ocean floors and external pressures that are greater than those inside the pipe. Innovative

design, fabrication, and installation techniques must emerge to enable these new resources to reach existing markets at attractive prices.

Technology improvements are also needed for expanding and managing the delivery system and improving efficiency at the burnertip. The increased challenges of serving a growing market and changing load must not jeopardize the historical reliability and favorable economics of the transmission and distribution system. Pipelines and LDCs will continue to rely on technology for reducing operation and maintenance expenses and minimizing environmental impacts of facilities construction. Information and communications technology will play an ever-increasing role in safe and efficient operations as well as in supply management and customer service enhancements.

Technology advances are essential in all industry segments for improving operational efficiencies, reducing resource development time, increasing production, developing frontier areas, controlling costs, and minimizing environmental impact. This study assumes that technology improvements will continue at an aggressive pace. However, recent industry trends in research and development spending have raised concerns regarding this assumption. Industry restructuring, consolidations, and spending cuts have resulted in reductions in research budgets. Producers are turning to the service sectors to develop new technology for specific applications. Industry consortia have been formed to address critical technology challenges such as deepwater development. While many of these changes improve the efficiency with which research and development dollars are spent, concerns have been widely expressed that basic and long-term research are not being adequately addressed.

Financial Requirements

Adequate financial performance must be demonstrated in order to compete for and attract the investments required to meet the growing demand. Companies will need to balance short-term performance demands with long-term planning to achieve the needed growth. Almost $1.5 trillion ($1998) will be required to fund the industry through 2015. This amount includes over $700 billion for operating expenses and an estimated $781 billion for capital investments. Approximately $658 billion of capital is projected to be spent for oil and gas supply development and about $123 billion for transmission, storage, and distribution infrastructure expansion (Figure 9). This equates to an average annual increase in capital expenditures from $34 billion per year between 1990 and 1998 to $46 billion between 1999 and 2015. Many of these expenditures will involve higher risk projects—such as large deepwater projects or pipelines to new frontiers—each of which can easily exceed $1 billion.

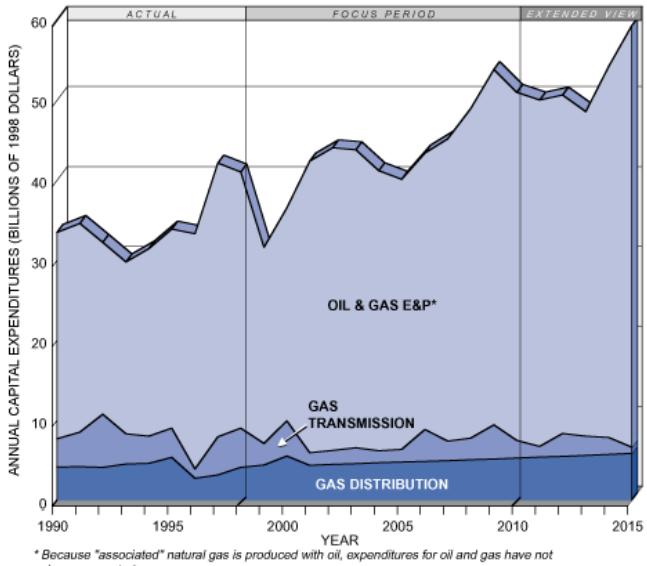
While much of the required capital will come from reinvested cash flow, capital from outside the industry is essential to continued growth. To achieve this level of capital investment, industry must be able to compete with other investment opportunities. This poses a challenge to all sectors of the industry, many of which have historically delivered returns lower than the average reported for Standard and Poors 500 companies.

The transmission and distribution sectors of the industry also face challenges in attracting investments to future projects. Expanding the infrastructure of the delivery system to accommodate increased demand and changing requirements of new customers will involve changes in financial risks. For example, expiring long-term LDC contracts for pipeline capacity, which historically provided the financial backing for pipeline expansions, will be replaced by shorter term contracts with new non-utility customers. Uncertainty exists with future rate structures and obligations to serve, as electricity and gas restructuring continues. Industry participants and regulators must work together to find an appropriate balance for these risks so that the needed infrastructure expansions can be accomplished.

Skilled Workers

A significant concern of the industry is the future availability of skilled workers at all levels to produce the increased supply and construct the necessary infrastructure. Company consolidations and volatile fluctuations in oil prices have resulted in cuts in exploration and production budgets, leading to layoffs at all levels in exploration and pro-

Figure 9. Capital Required for Expansion



** Because "associated" natural gas is produced with oil, expenditures for oil and gas have not been separated.*

- Substantial increase in capital expenditures will be required.
- Total capital expenditures for 1999–2015 will be $785 billion.

Source of historical data: American Gas Association, *1998 Gas Facts;* and estimates from EEA, Inc.

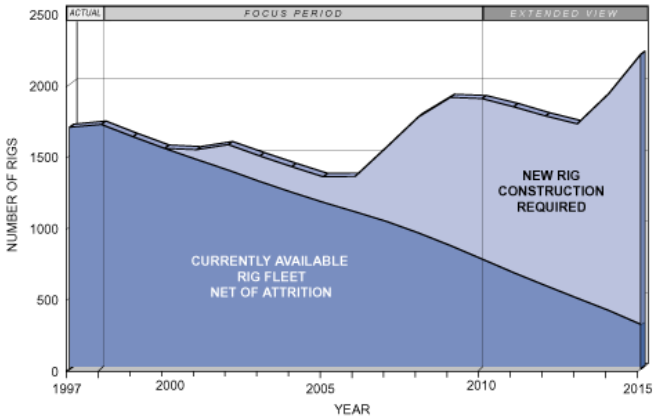
duction companies and in service/supply companies. Approximately 500,000 jobs have been eliminated from the industry since the early 1980s, with over 40,000 job cuts occurring in the producing sector alone in the past year. Simultaneous reduction in industry hiring rates in the last 20 years has resulted in a disproportionate percentage of the workforce reaching retirement age in the next decade—an average of 40% in a sampling of major producers. Furthermore, the next generation of workers is not choosing to enter the industry, as indicated by the significant decrease in enrollment in some energy-related college curricula

since the mid-1980s. The oilfield service/supply sector faces a similar situation as many laborers and supervisory personnel have left the industry in search of more stable work. Higher wage scales are likely to be required to attract workers back into the industry.

Drilling Rigs

The U.S. drilling fleet must expand to undertake the dramatic increase in activity that will be required over the next decade to produce the additional supply. The total number of oil and gas wells drilled per year (including dry holes) will have to double, from approximately 24,000 in 1998 to over 48,000 by 2015. Even taking into account anticipated improvements in drilling efficiencies, approximately 2,300 active rigs (over 2,100 land rigs and 180 offshore) would be needed to achieve this level of drilling. This

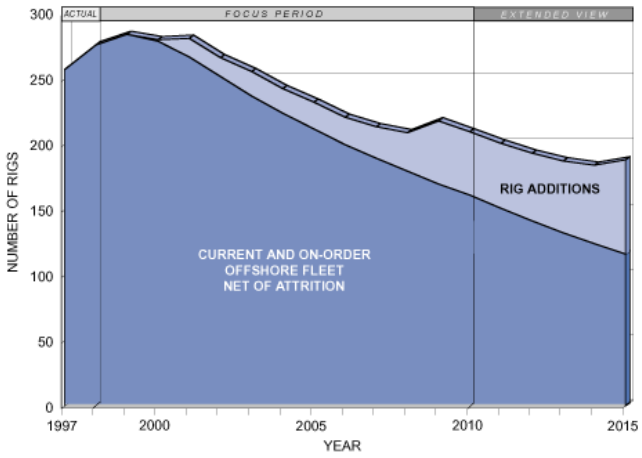
Figure 10. Onshore Drilling Rig Fleet



- 1,900 new onshore rigs will be needed through 2015, as the number of wells drilled per year doubles.
- Very few onshore rigs have been built since the 1980s.
- Availability of skilled workers to build and operate these rigs is a concern.

Source of historical data: "Reed Rig Census," 1997–1998 (published in *World Oil*); and estimates from EEA, Inc.

Figure 11. Offshore Drilling Rig Fleet



- 72 additional offshore rigs will be needed.
- Additions may be from reactivations, new construction, or relocations.
- Availability of skilled workers is also a concern.

Source of historical data: Offshore Data Services, *Rig Locator*, September 24, 1999.

represents an 80% increase over the 1,250 average active rig count estimated for 1999.

Rig availability, which is crucial to exploration and development, will be a challenge for the industry. The oilfield supply and service sectors have been hit particularly hard by the boom and bust cycles. Very few new onshore drilling rigs have been built since the mid-1980s. If the 5% per year historical attrition rate were to continue, most of the existing 1,700 onshore rigs would be retired by 2015 and a total of almost 1,900 onshore rigs would have to be built (Figure 10). Additions to the offshore rig fleet will also be needed and are projected to include 10 deepwater drilling rigs, 32 platform rigs, and 30 jack-up rigs and barges (Figure 11). Although the number of

new offshore rigs is smaller, the average cost per rig is significantly higher than that of onshore rigs. The drilling sector and the manufacturers of drilling equipment are not currently positioned to undertake this level of expansion.

Lead Times

Reduction of development lead times—from lease acquisition and prospect identification, to the beginning of exploration, to pipeline construction for delivery to the burner tip—is critical to meeting the gas demand projected in this study. For example, as many as 10 years—or two-thirds of the time period of this study—may elapse between the time a block in the offshore is leased until production flows to market. Industry and government are working diligently to reduce development time by streamlining processes and applying new technology. However, access limitations and cumbersome permitting and approval processes often negate those improvements. For example, increases in time required to perform studies previously conducted by government agencies, and obtain multi-agency permits have resulted in production project delays of up to two years on federal lands in the Rocky Mountain region. While the MMS has improved the approval process for offshore development by serving as the facilitator for the process, production and pipeline projects on land still require extensive interactions with multiple levels and agencies of federal, state, and local governments. For example, the recently constructed Portland Natural Gas Transmission System involved the acquisition of over 150 permits and/or approvals from federal, state, and municipal government agencies. Most of the agencies involved in these processes have different data requirements, forms, and processes. Additional improvements are needed immediately in order to impact the development in the outer years of this study.

Changing Customer Needs

The ongoing regulatory restructuring of the natural gas and electricity markets changes the roles and responsibilities of all industry participants. As restructuring continues to unfold at the state level, the roles and obligations of LDCs and electric utilities will be changing. Other energy market participants may accept some aspects of the former roles of the LDCs and electric utilities as services are unbundled. These other participants, such as producers, generators, marketers, energy service providers, and end-users will contract for and use capacity differently than the LDCs and traditional electric utilities. In addition, new flexible services will be required to meet the anticipated increase in gas demand for electricity generation as projected in this study. For example, natural gas-fueled turbines (simple and combined cycle) have unique operating requirements in terms of inlet pressures and operations. Since electricity cannot be stored, the electricity generation systems must be constantly monitored and adjusted to change output instantaneously as electricity demand changes. Thus corresponding changes in natural gas demand occur constantly throughout the day. These changes in roles, services, and customer requirements will cause all sectors of both the natural gas and electricity industries to manage their assets differently.

Sensitivity Analyses

As discussed earlier in this report, sensitivity analyses provided some important information regarding the importance of the critical factors (see Figure 12a). Demand, for example, can increase by 0.6 TCF in 2010 if gross domestic product (GDP) grows by 3.0% annually instead of 2.5%. Conversely, GDP growth of 2.0% could result in a decrease in demand of 0.9 TCF by 2010. If crude oil price averaged $22.00 rather than $18.50 as assumed in the Reference Case, demand could increase by 0.7 TCF in 2010. However, demand would be 1.0 TCF lower if crude oil price averaged $15.00.

The model's output on price also served as a gauge for quantifying the impact of certain assumptions (Figures 12b and 13). While the model projects an average production weighted U.S. wellhead gas price through 2010 of approximately $2.74 per million British thermal units (MMBtu), prices in the sensitivity analyses change significantly. For example, the model projects that gas prices could be as much as $0.32 per MMBtu lower in 2010 if technology improvements are significantly better than assumed in the Reference

Figure 12a. Influence of Key Assumptions on Natural Gas Demand

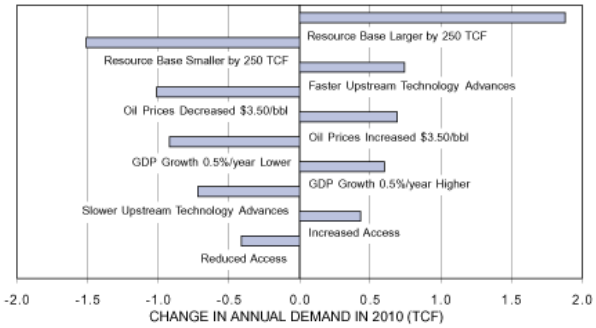
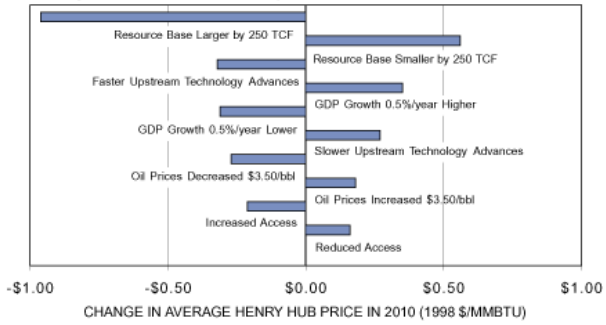


Figure 12b. Influence of Key Assumptions on Natural Gas Price

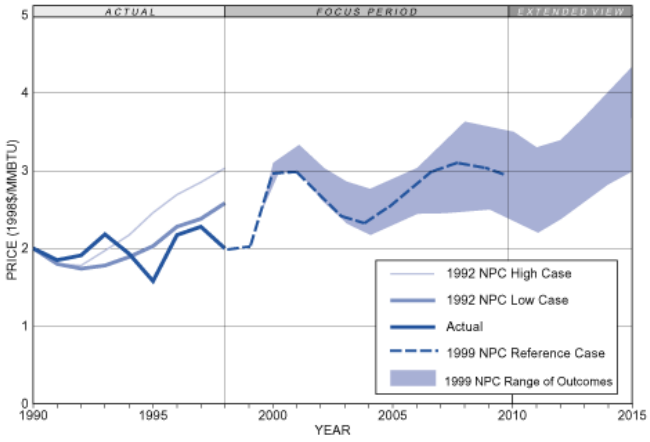


- A 15–20% change in the resource base has substantial impact on projected price and demand.
- Pace of technological advancement also has significant influence on projected price and demand.

NOTE: See Figures 14a and 14b for more details on resource base and access cases.

Figure 13. Historical and Projected U.S. Natural Gas Prices*

Lower-48 Weighted Average Wellhead Price



** Prices are NOT intended to be a forecast. Seasonal factors such as abnormal weather and demand fluctuation have not been taken into account.*

- Actual price for 1991–1998 averaged $1.97 versus 1992 study projections of $2.06–2.34.
- Price volatility will likely continue.
- Sensitivity analyses demonstrate the range of outcomes for key assumptions.
- The market will ultimately determine the price of natural gas.

Source: DOE/EIA, *Monthly Energy Review*, September 1999.

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Case. Conversely, a slower pace of technology improvements could drive the price up by $0.27 per MMBtu.

The single most significant assumption in the Reference Case is the size of the resource base. The model projects that the price of gas could be lowered by as much as $0.96 per MMBtu in 2010 if the economically recoverable resource base were found to be 250 TCF larger than assumed in the Reference Case. In this case, demand increases by 1.9 TCF and U.S. production increases by 1.5 TCF. A second sensitivity was run to examine the impact of a smaller resource base, although it should be noted that the resource base estimates have always increased over time. If estimates of the resource base are lowered by 250 TCF, prices could be as much as $0.56 per MMBtu higher, demand would be 1.5 TCF lower, and U.S. production would be 1.6 TCF lower. While this sensitivity was run to evaluate the impact of learning more about the resource base, it also provides some insight to the impact of access restrictions. Access is an important factor because it removes potential supply from the available resource base. Access restrictions also limit the opportunity to better assess the resource size in those areas.

To better quantify the impact of access restrictions, two additional sensitivity cases were developed. The first case tightened access restrictions in the Rocky Mountain region and eliminated the planned MMS Lease Sale 181. In this reduced access case, price increased $0.16 per MMBtu in 2010 and demand decreased by 0.4 TCF. U.S. production decreased by 0.5 TCF. The second sensitivity case relaxed access restrictions in the Rockies and made currently restricted offshore regions available for leasing in 2004. This increased access case resulted in an increase in U.S. production of 0.5 TCF in 2010, an increase in demand of 0.4 TCF and a corresponding decrease in price of $0.21 per MMBtu. More importantly, a dramatic shift occurred in the Extended View period of the increased access case with an increase in demand of 1.5 TCF in 2015, a corresponding increase in U.S. production of 1.6 TCF (primarily from the Rockies and the eastern Gulf of Mexico), and a corresponding decrease in price of $0.45 per MMBtu (Figures 14a and 14b).

The most important conclusion derived from these sensitivity analyses is that the future availability and cost of natural gas can be influenced. While some variables cannot be controlled, factors such as the rate of technology development, knowledge of the resource base, and access to the resource base can be impacted—either positively or negatively—by the actions of the industry and the government.

The Council wishes to emphasize that the price output of the model is not to be used as a forecast, but rather as an indicator of the relative influence of the critical factors and assumptions. Seasonal factors that affect price, such as abnormal weather and demand fluctuations, have not been taken into account. The market will ultimately determine the price of natural gas. However, actions can be taken by industry and government to ensure that adequate supply is available, that it can be delivered to the market, and that the ultimate price is competitive through the study period and beyond.

In summary, affordable energy is necessary to sustain continued growth of the nation's economy and quality of life. Natural gas will play an important role, particularly as it helps the nation meet its environmental goals. By 2015, more than 14 million new customers will be connected to natural gas supply through over 300,000 miles of new transmission pipelines and distribution mains. Many more customers will use electricity that is fueled by natural gas as over 140 gigawatts of new electricity generation capacity—almost entirely gas-burning units—go into service. These new customers, as well as the existing customer base, are counting on long-term availability of reliable, competitively priced natural gas to meet their energy needs and to support the nation's environmental goals. Industry, government, and other stakeholders must act quickly, cooperatively, and purposefully to meet those expectations.

Figure 14a. Impact of Size of Resource Base and Access on U.S. Natural Gas Production

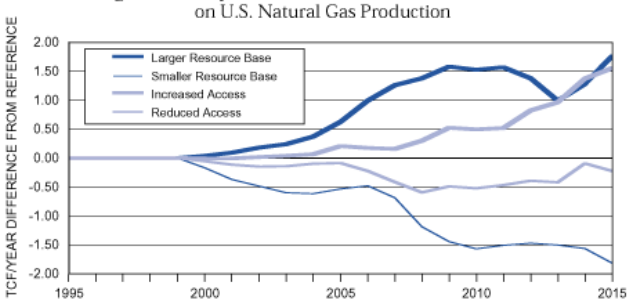
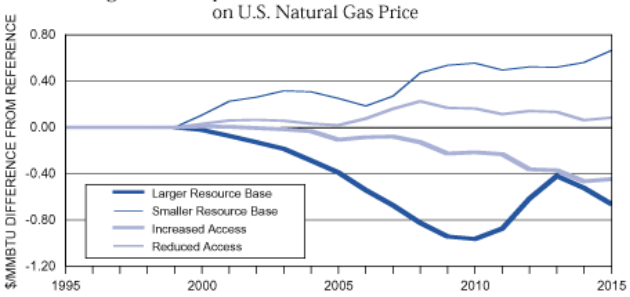


Figure 14b. Impact of Size of Resource Base and Access on U.S. Natural Gas Price



- Larger resource base would increase U.S. natural gas production 1.8 TCF in 2015 and decrease price $0.66.
- Smaller resource base would decrease U.S. natural gas production 1.8 TCF and increase price $0.66.
- Increased access would increase U.S. natural gas production 1.6 TCF in 2015 and decrease price $0.45.
- Reduced access would decrease U.S. natural gas production 0.2 TCF in 2015 and increase price $0.08.



Recommendations

The Council wishes to emphasize that gas supply, and the associated infrastructure, can be expanded to meet growing demand if the critical factors are adequately addressed. The following recommendations are made by the Council to ensure that the mutual goals of government, industry, and consumers are met. While recommendations are made to the government for specific actions, the Council does not advocate regulations or legislation that artificially alter market signals. Instead, the Council encourages changes that remove impediments which hinder the development of supply and infrastructure to meet market needs.

Recommendation 1:
Government and industry must take a leadership position in establishing—at the highest level—a strategy for natural gas in the nation's energy portfolio. An Interagency Work Group on Natural Gas should be established to work with industry and other stakeholders to formulate the strategy and resolve issues.

The government can help to overcome the barriers to meeting future natural gas demand by establishing a national strategy for natural gas. This strategy should include the areas of supply, demand, and transmission/distribution and should address the issues of access to the resource base, technology development, environmental regulation, education of the future workforce, and financial incentives. It should also affirm and describe the role of natural gas in balancing the national objectives of economic growth, environmental protection, and energy security. The strategy must provide a proper balance between conflicting environmental and land-use interests, yet reflect a sense of urgency about developing natural gas supply and the delivery infrastructure given the long lead times required.

The Council recommends that an Interagency Work Group on Natural Gas be established within the National Economic Council to formulate this comprehensive natural gas strategy and identify and aggressively resolve the issues associated with the development of natural gas supply and supporting delivery systems. This Interagency Work Group should be analogous to, but distinct from, the Interagency Working Group on Energy that has been set up under the National Economic Council to address oil industry issues. This new Work Group should oversee the implementation of government-related recommendations contained in this report. It should also monitor, on a biennial basis, trends for the assumptions used in this study and progress on the identified critical factors in order to anticipate changes in the supply/demand equation.

All federal agencies that have a role in natural gas policy, technology, and resource assessments should be members. The Work Group should make every effort to include input from industry and other stakeholder groups, including states with natural gas production or potential for production, in its strategy-setting process. This solicitation of stakeholder views should be as interactive as possible.

The industry must also step up to the leadership challenge and work with government and other stakeholders to identify and understand their issues associated with developing supply and delivery systems and to seek practical solutions. Industry must work with customers to understand future supply and delivery needs and work with government to shape appropriate strategy and policies so that the required services can be provided in the most cost-effective manner while ensuring safety and reliability. Industry councils and trade associations can play an integral role in this effort.

Recommendation 2:
Establish a balanced, long-term approach for responsibly developing the nation's natural gas resource base.

As seen in the analysis of critical factors in this report, the estimated size of the resource base is the single most important factor in projecting availability of competitively priced natural gas. While the ultimate size of the resource base cannot be changed and cannot be precisely known, industry can continue to improve its knowledge of the size and characteristics of the resource base, thus improving the likelihood of locating and producing new supply. However, access to a significant portion of this resource base for either assessment or development is subject to restrictions due to environmental and land-use concerns. These concerns are appropriate for consideration in granting access to potential supply areas, but significant improvements in the industry's environmental footprints warrant a new look at these restrictions.

Given the compelling need for developing economic natural gas supply, the following actions are recommended:

- *Government agencies and industry representatives should continue the work begun with this study to inventory existing information on the resource base in the Rocky Mountain region and analyze the impact of access restrictions.* A significant portion of work associated with this study included a first-time assessment of resource impacts associated with land access restrictions and related environmental stipulations in six areas in the Rockies. The results were then extrapolated to the entire region. This involved a cooperative effort between members of the Supply Task Group and representatives from the federal government, including the U.S. Department of Energy, the Bureau of Land Management, and the U.S. Forest Service. Representatives from state and local governments, as well as other stakeholders, also participated. This analysis, and the cooperative approach, should be continued and expanded beyond this study to increase understanding of the impact of access restrictions in the Rockies.
- *Industry should work with the government to prioritize restricted areas on the basis of resource potential as well as environmental sensitivity.* Certain restricted areas should be more fully assessed to determine the potential for gas supply. Those with higher potential and lower sensitivity should be opened for additional geological assessment. Industry should work with the government to identify methods and technologies that could be practically applied to minimize the environmental impact of the assessment.
- *A comprehensive approach should then be established for developing gas supply in selected restricted areas.* Existing moratoria should be reviewed and modified as appropriate. Industry should continue to develop practical techniques that minimize environmental impact, particularly for these sensitive areas. Once a long-term development plan is in place, the affected agencies should work together to coordinate their roles in assisting that development. A template for long-term planning

and coordination among multiple agencies can be found in the MMS and their management of the offshore region.

- *Long-term sustainability of natural gas supply should be addressed.* The current study finds that, with focused effort, the gas demand through 2015 and well beyond can be met with sustainable gas supplies from U.S. and Canadian resources. The life of the resource base can be further extended by encouraging efficiency at the burner tip. However, the Council also recognizes that at some point in the future—though probably not within the timeframe contemplated by this report—the United States will need to develop resources in what are now regarded as far frontiers. Such sources might include Alaska, large-scale LNG imports from a variety of foreign sources, and possibly gas transported by pipeline from the Caribbean and Latin America.

  Gas hydrates—frozen crystals of methane and water found both below the ocean floor and in Arctic regions—could also be a potential source of natural gas. In *Turning to the Sea: America's Ocean Future* (September 1999), the Secretaries of Commerce and Navy recommend the acceleration of scientific research on ocean hydrates. In addition, the Department of Energy's Office of Fossil Energy issued a document, *A Strategy for Methane Hydrates Research & Development* (August 1998), that provides for a comprehensive national research program that includes both marine and Arctic hydrate resources.

  Projects to reach the far frontiers will be very expensive and will have extremely long lead times. At some point during the study period, government and industry must begin a cooperative, public planning process to lay the groundwork for far frontier projects.

The recommended Interagency Work Group could play a very important role in addressing access issues and the long-term sustainability of natural gas supply. The Work Group should be assigned the following responsibilities:

- Establish a set of principles that would guide federal land management policy. These principles should balance the national goals of economic growth, environmental protection, and energy security and should recognize the unique role of natural gas in meeting national objectives in the areas of clean air, climate change, electricity industry deregulation, and domestic energy supply. The guiding principles should also emphasize the need for multiple use of public land. Recognizing that it is the primary responsibility of the Secretaries of the Interior and Agriculture to establish land management policies within their jurisdictions, the guiding principles should help put those policies and priorities in a national policy context with respect to natural gas. The principles should be used by the appropriate land management and regulatory agencies to establish policies that promote domestic production of natural gas in order to meet national goals.
- Address the barriers that restrict access to natural gas resources in the Outer Continental Shelf and on onshore federal lands, particularly in the Rocky Mountain region where the majority of the onshore public gas resource is found. The goal of this effort should be to maximize the amount of economic natural gas resource available for development (consistent with effective environmental protection), reduce delays in natural gas exploration, production, and transportation, and improve consistency among federal and state agencies. The Work Group should oversee the continuing effort to inventory the impact of access restrictions on natural gas resources as discussed above. It should also evaluate the process by which access to the natural gas resource base and pipeline rights-of-way has been restricted in the past and may be further restricted in the future. The Work Group should look at the following categories of barriers:

  — Land withdrawals that put natural gas resources off limits

  — Regulatory and policy decisions that make natural gas resources effectively off limits or impractical to recover, such as:

    – "no surface occupancy" designations

- use of stipulations more restrictive than needed to protect environmental resources
- old access restrictions that don't account for the effect of technology improvements that might allow development of natural gas in environmentally sensitive areas
- air quality issues that threaten to delay or limit natural gas exploration and production.

— Decisions and applications of regulations and policies that increase the cost of or impose unnecessary delays in natural gas recovery and transportation, such as:

- "combined hydrocarbon" leasing that imposes unnecessary costs on producers
- a cumbersome Coastal Zone Management process that imposes delays on OCS leasing.

Recommendation 3:
Drive research and technology development at a rapid rate.

Technology is another highly critical factor affecting both supply availability and price. Accelerating the development of technology is in the best interests of all stakeholders. The following industry and government actions are recommended:

- *Industry participants must aggressively build on past successes in advancing technologies by investing in research and supporting additional industry consortia.* Transmission and distribution companies should continue to invest in improving the efficiency of the delivery systems. All industry segments should explore additional applications that advanced information and communication technology can provide. Industry must continue to fund basic research, both independently and through grants to universities. Industry must also continue to invest in the development of technologies that reduce the environmental impact of exploration, production, and construction of infrastructure. Industry and consumers should continue to develop more efficient gas consumption equipment, thereby improving energy efficiency and yielding lower costs to consumers.

- *The government should continue investing in research and development through collaborations with industry, state organizations, national laboratories, and universities.* Efforts should be made to define key research and development priorities to support increased reserve growth in existing fields and new field discoveries in areas with the largest potential resource and to support expansion of the delivery infrastructure. Examples of specific research that government might sponsor include:

  — Reservoir detection and characterization technology targeted at exploration and field development

  — Technologies to reduce the cost of environmental compliance

  — Innovative geologic and engineering concepts based on novel technologies such as 3D and 4D seismic and horizontal drilling

  — Technologies to further ensure the reliability, security, and integrity of the delivery system.

  Particular consideration should be given to long-term technology needs for ultra-deep water, low permeability, and non-conventional reservoirs that will contribute more of the nation's gas supply in the future. Policy issues that affect technological developments should also be addressed.

- *The government should promote high-efficiency gas technologies such as fuel cells, gas cooling, and high-efficiency turbines.* Due to the inherent environmental advantages of natural gas and the high

efficiencies offered by new gas equipment, the use of gas in place of other fossil energy forms promotes both energy conservation and environmental improvement (e.g., in areas such as acid rain, ozone formation, particulate emissions, and solid waste disposal). All energy efficiency evaluations and standards should be based on a "total energy efficiency" concept, that is, energy efficiency measurements should include energy used or lost from the point of production through consumption.

The recommended Interagency Work Group on Natural Gas can play a significant role in overseeing technology investments made by the government. Industry and state agencies should be actively involved with the Work Group in directing these efforts.

Recommendation 4:
Plan for capital, infrastructure, and human resource needs.

The long-term demand growth projected in this study translates to long-term opportunities for the industry and the government. The increase in demand provides the opportunity for industry participants to expand their markets and to increase their service offerings. Benefits to the government extend beyond meeting environmental goals and include increases in revenues from royalties, rentals, and bonuses from the leasing of federal lands and development of the resources. For example, income generated by the Offshore Mineral Management Program alone generates about $4 billion annually. However, taking full advantage of these opportunities will require long-term resource planning on the part of industry and government. The following areas should be specifically addressed:

- *Industry must immediately address concerns regarding the future availability of skilled workers.* Several years are required to train highly skilled workers to perform their jobs knowledgeably, efficiently, and safely. Given the projected increase in activity and the impending increase in retirements, aggressive action must be taken to attract, train, and retain qualified workers at all levels. Industry must also undertake initiatives to attract high school students with strong math and science skills to replenish college enrollments in petroleum, geotechnical, and other energy-related disciplines. Government funding of energy-related studies in universities can also help to populate these disciplines.

- *Producers, drilling companies, and equipment manufacturers should form a joint industry task force, headed by the International Association of Drilling Contractors, to gather additional information on infrastructure needs.* Of particular concern is the projected need to increase the number of wells drilled per year and increase the drilling rigs and equipment required to accomplish that task. The task force can begin its study by collecting data, such as drilling success rates in deeper formations and drilling rates for deep vertical wells, that are needed for assessing future needs. The task force should include rig builders and shipyard operators as well as industry groups such as the Petroleum Equipment Suppliers Association.

- *Government should examine possible new financial incentives, such as limited-duration tax and royalty incentives, that would accelerate the development of high-risk, high-cost natural gas resources onshore and offshore.* Past support from the government, such as tax credits and deepwater royalty relief, has promoted development activity. The MMS, in their January 1999 publication on deepwater development facts, states "The Deepwater Royalty Relief Act, passed in 1995, has contributed significantly to the increase in deepwater activity by providing the opportunity to lease new prospects in deepwater." The MMS reports that Gulf of Mexico OCS bids for leases in water greater than 800 meters increased from 49 in 1994 to 1,138 in 1997 and 817 in 1998. Other types of incentives should also be explored with input from industry advisors. These

incentives, if properly targeted, can convert non-economic resources into economic supply.

Recommendation 5:
Streamline processes that impact gas development.

Once a high level policy is established, all agencies involved in the development of supply and delivery systems should review and align existing policy to eliminate conflicting directives and remove obstructions. Processes that affect development must be streamlined to eliminate duplicative efforts, follow more predictable time-lines, and eliminate unnecessary costs to the industry, government, and, ultimately, consumers. Approval processes involving multiple levels of government, and agencies should be coordinated in order to resolve conflicts in a timely manner.

The Council recommends that the following areas be be evaluated:

- Updating of resource management plans for federal lands
- Potential for sharing land management and environmental assessment resources, such as data bases and personnel, among agencies
- Designation of sufficient budgets for required land-management planning and studies
- Adequacy of legislation for land-management policy and procedures
- Opportunities for coordinating permitting/approval processes among agencies.

Recommendation 6:
Assess the impact of environmental regulation on natural gas supply and demand.

Additional evaluation is needed to fully assess the impact of existing and proposed environmental regulations on natural gas supply and demand. As shown in this study, regulations that address issues such as climate change and emissions controls on electricity generation could have a significant impact on natural gas demand and the ability of the industry to meet that demand. Changes in regulations and additional moratoria or extensions of existing moratoria that reduce access to natural gas supply should be examined in the context of the need for increasing gas supply. The recommended Interagency Work Group could play an important role in this analysis by developing and coordinating a process for reviewing any proposed regulations to ensure that the benefits of increasing natural gas use are considered in the regulatory process.

Recommendation 7:
Design new services to meet changing customer needs.

In response to the ongoing restructuring of the natural gas and electricity markets, all industry participants must offer new or reconfigured services specifically designed to meet changing customer needs. For example, individual pipelines and many LDCs are implementing new services to meet customer needs through filings for services such as parking, loaning, balancing, peaking, and hourly firm transportation. While industry-wide changes may take some time to implement, individual pipeline changes can be developed and approved in far less time. When new services are offered to gas customers, maximum choice should be ensured by allowing all parties to compete for the provision of those services in a non-discriminatory manner.

The members of the National Petroleum Council stand ready to further discuss and implement the recommendations made in this report. Members will assist the Interagency Work Group in identifying impediments and solutions to the mutual goals of government, industry, and consumers for increased availability of competitively priced, environmentally desirable natural gas.



Summary of Key Findings

The following information supplements the conclusions and recommendations with an overview of the findings from the three task groups. Additional detail on the findings, assumptions, sensitivities, and model output can also be found in the task group reports.

The various projections and sensitivities presented in this report were prepared using market simulation models developed by Energy and Environmental Analysis, Inc. (EEA). The oil and gas supply projections were prepared using the GRI Hydrocarbon Supply Model, which was integrated with the gas demand, storage, and transportation elements of EEA's Gas Market Data and Forecasting System.

The GRI Hydrocarbon Supply Model was originally developed by EEA for the Gas Research Institute (GRI) in the early 1980s and was the basis for the gas supply projections and scenario analysis for the 1992 NPC Study on natural gas. The model characterizes oil and gas exploration, development, and production in nineteen U.S. and five Canadian regions. Each region is further broken down into four to eight subareas, usually representing drilling depths for onshore regions or water depths for offshore regions. Proved reserves and undiscovered resources for gas are divided into associated-dissolved gas, conventional high permeability gas, tight gas, shales, and coalbed methane. The Hydrocarbon Supply Model provides the user with a wide range of options for selecting assumptions for resource base, drilling and development cost, technological improvements, upstream environmental compliance costs, land access, and financial parameters.

The Hydrocarbon Supply Model's projection of future natural gas deliverability by region was used in the Gas Market Data and Forecasting System to solve for monthly gas production, storage activity, pipeline flows, end-use consumption, and prices at locations in the United States, Canada, and the Mexico/U.S. border. This model was used to project gas demand in the United States and Canada and to determine the pipeline and storage infrastructure that would be economically justified in the various cases developed for this report. Key inputs to the model that can be varied among cases include a wide variety of drivers to gas demand and infrastructure-related parameters such as the cost of new pipeline and storage facilities.

Each task group established key assumptions and identified the variables that could significantly influence the model in their study area. Some of the key assumptions used in the 1999 Study for the 1999–2015 period are listed in Table 1. As indicated in Table 1, the model uses a U.S. GDP growth rate of 2.5% per year throughout the study period. This rate is below the rate at which GDP has grown in recent years. However, history has shown that recessions have interrupted periods of significant growth and resulted in a lower average growth over an extended period. The

TABLE 1

KEY MODEL ASSUMPTIONS

U.S. GDP Growth	2.5% per year
Canadian GDP Growth	2.2% per year
U.S. Industrial Production	3.0% per year
U.S. Inflation Rate	2.5% per year
Crude Oil Price (WTI)*	$18.50/bbl in 1999 dollars
Crude Oil Price (RACC)†	$16.50/bbl in 1999 dollars

*West Texas Intermediate.

†Refiner Acquisition Cost of Crude in the United States.

Council concluded that a 2.5% growth rate was reasonable, but sensitivity analyses were conducted to test the effects of both higher and lower rates. The Canadian GDP growth rate was assumed to be 2.2%, or 0.3% lower than the U.S. rate, reflecting a relative value that has prevailed over the last 10 years.

The crude oil prices used in the model were selected to approximate the average real prices experienced in the 70 years from 1929 to 1998. These crude oil prices affect the outcome of the model by determining the wellhead values of crude oil and natural gas, thereby setting the price of fuel oils that compete with natural gas in end-use markets. The oil prices also strongly influence the amount of capital that producers have available for reinvestment in exploration and production development. Sensitivity analyses were run to test the effect of both higher and lower oil prices.

Findings of the Demand Task Group

Demand Finding 1:
Rapid growth exceeded expectations of the 1992 Study.

Consumption of natural gas grew much faster in the 1990–98 period than was anticipated. Despite the warmer-than-normal weather that prevailed in 1998, demand grew over that nine-year period in all end-use categories. The various studies of natural gas demand that have been conducted in the past decade have consistently underestimated actual growth in demand. The 1992 NPC Study was no exception, as shown in Figure 2. The High Reference Case in the 1992 Study projected that total demand could grow from 19.3 TCF in 1990 to 24.8 TCF in 2010, with 1998 projected at 20.9 TCF. Actual demand in 1998 was 22 TCF (including net storage fill), or about 1 TCF ahead of the level forecast for 1998 in the 1992 Study.

Several factors caused the 1992 Study to underestimate actual growth in gas demand. Growth in GDP was assumed to be 2.4% annually and actual growth for the 1990–98 period was 2.6%. Although energy intensity measured by Btu per unit of growth declined between 1990 and 1998, it declined at a much slower rate than the 1992 Study had anticipated. Most of the increased gas demand occurred because of an increase in total energy demand.

Gas demand grew during this period, even as the market was restructured significantly. In 1990, prior to the restructuring, over 90% of the gas moving in interstate pipelines was owned by the pipeline companies. FERC actions in the early 1990s have transformed interstate pipelines from sellers and transporters to solely open-access transporters. Many state regulatory agencies and LDCs are moving toward the same type of transformation.

In addition, major consolidations have occurred within the gas industry in anticipation of and response to the restructuring of the gas and electric industries. Numerous combinations of energy service providers have occurred within and across industry segments, as evidenced by the combinations of gas and electric companies. In most cases, mergers have been driven by the need to improve competitive position through economies of scale, greater geographic spread, more diversified services, and acquisition of expertise. These actions, along with increasing competition, have resulted in services that are generally more responsive to customer needs and are provided at lower prices.

The gas delivery system has remained the safest form of transport and continues to provide reliable service despite these massive

changes. *Natural gas consumption has grown to a degree that its most ardent supporters would have found amazing at the time the 1992 NPC Study was prepared.*

Demand Finding 2:
Demand is projected to increase by 32% between 1998 and 2010.

U.S. natural gas consumption is projected to grow from 22 TCF in 1998 to 29 TCF in 2010 and could increase beyond 31 TCF in 2015 (see Table 2). Canadian gas demand is expected to rise from 2.8 TCF in 1998 to 3.5 TCF in 2010 and 3.8 TCF in 2015.

The most significant growth in gas demand is projected to be for electricity generation. In the 1992 Study, increased penetration of the electricity generation market was an *expectation*. Today—as result of dramatic improvements in heat rate for combined-cycle gas/oil generating equipment, the relatively low capital cost of such plants, the relatively short construction time required to bring them on line, tighter emission standards for electricity generation, and the deregulation of the electricity industry—gas is the *preferred choice* of the electricity generation industry for new generating plants. Currently, 98% by capacity of the 243 electricity generating plants that have been announced for construction in the next five years are to be gas-fired; the remaining 2% by capacity will be fueled by coal, oil, wastewood, wood, wind, and other.[1]

A number of key assumptions were made concerning electricity generation. One assumption was that 113 gigawatts of gas/oil combined-cycle and gas-fired combustion turbine capacity would be operating by 2010 (an increase from 25 gigawatts in 1998) and a total of 140 gigawatts by 2015 to satisfy incremental electricity demand. The 1999 Study determined that, through 2010, the cost of electricity generated from new coal plants (including capital costs) would not be competitive with electricity from new gas units, but that after 2010 an estimated 20 gigawatts of new coal capacity would be built. Heat rates for all classes of electricity generation are assumed to improve 3 percentage points between 1998 and 2015. Seventy percent of

[1] Source: Online data base at Resource Data International, Inc. (July 1999).

TABLE 2

U.S. NATURAL GAS CONSUMPTION
(Trillion Cubic Feet)

	1998	2005	2010	2015
Total Consumption	22.0	26.3	29.0	31.3
Total End-Use	19.4	24.0	26.4	28.7
Residential	*4.5*	*5.6*	*5.8*	*6.1*
Commercial	*3.0*	*3.7*	*3.8*	*4.1*
*Industrial**	*8.6*	*9.6*	*10.2*	*10.8*
Electricity Generation	*3.3*	*5.1*	*6.6*	*7.8*
Lease, Plant, & Pipeline Fuel	2.0	2.2	2.5	2.5
Net Storage Fill/Balancing	0.6	0.1	0.1	0.0

*Historical data include all gas use for industrial cogeneration and independent power producers; all gas for new power plants except cogeneration is included in the electricity generation sector.

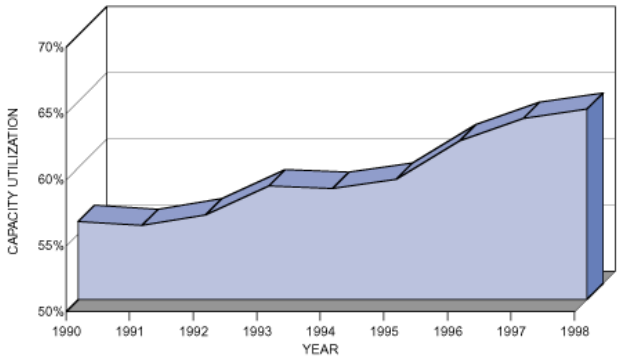
Source of historical data: Energy Information Administration, *Natural Gas Monthly*, September 1999.

combined-cycle plants are assumed to be capable of burning either gas or oil and would therefore switch fuels depending on cost. Coal capacity utilization was assumed to increase 11 percentage points from 64% in 1997 to 75% by 2015, continuing the trend observed in the last 10 years (Figure 15). However, this continuing increase in capacity utilization is recognized as a significant challenge for those facilities. Adding to this concern is the legal action taken in November 1999 by the EPA against several large utility companies, charging that their coal-fired plants had effectively added to their capacity during maintenance without installing new pollution control equipment. This recent action could have the impact of lowering coal capacity utilization, thus increasing demand for natural gas.

No new nuclear capacity was projected to be developed in the timeframe of this study and an estimated 15 gigawatts of nuclear generation capacity is projected to retire by 2015 as some licenses expire. The Demand Task Group projected that 15 gigawatts of nuclear capacity would be relicensed, and that a total nuclear capacity of approximately 80 gigawatts would remain in operation in 2015. The electricity generation industry has increasingly relied on its nuclear generation capacity, as seen in Figure 16. With the resumption of service at the Clinton, LaSalle, and Millstone units in the spring of 1999, nuclear capacity utilization reached an unprecedented peak of 96.5% in August 1999. This compares to the previous peak capacity utilization of 86% in July 1998 and the historical average of approximately 75%. The average annual capacity utilization of nuclear generating capacity is assumed to increase from 75% to 80% over the study period. Nuclear retirements beyond the few projected in this study could significantly increase natural gas demand in the 2010–2015 time frame.

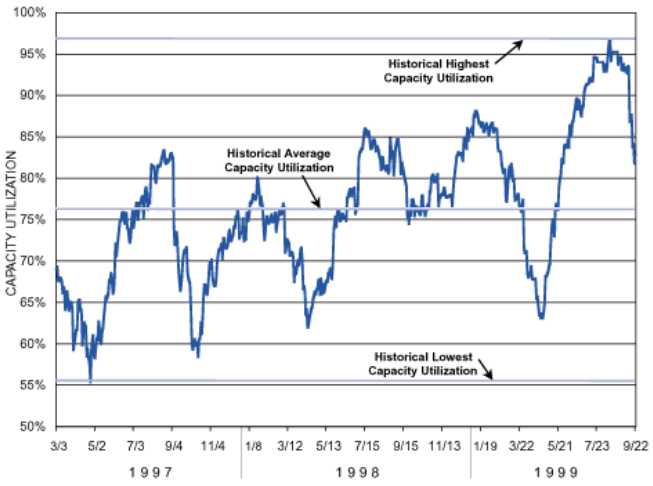
Hydroelectric and renewable generation are assumed to remain nearly constant throughout this case, although hydroelectric generation could diminish due to environmental concerns about the adverse impact of dams on anadromous fish populations, espe-

Figure 15. U.S. Central Utility Coal-Fired Electricity Generation Capacity Utilization



Source: DOE/EIA, *Electric Power Annual*, 1990–1998.

Figure 16. Total U.S. Daily Nuclear Capacity Utilization



Source: U.S. nuclear complex activity data, *BTU Daily*.

cially in the Pacific Northwest. However, such declines are assumed to be nearly offset by increased generation from renewable energy such as wind and solar. Increases in renewable capacity are evident because of existing and growing demand for "green power," and state-level legislation calling for renewable portfolio standards.

The Demand Task Group recognized that assumptions for key variables have a significant impact on ultimate demand. As discussed, assumptions were made for the Reference Case about the rate of increase in GDP, prices of competitive fuels (e.g., fuel oil and coal), construction of new gas-fired generating plants, the retirement of nuclear plants, and utilization rates of gas, coal, and nuclear plants. The highest-impact variables were tested with sensitivity analyses. GDP growth and oil prices proved to be significant drivers of gas demand. For example, if GDP growth were to average 3.0% per year rather than 2.5%, demand could increase by 0.6 TCF in 2010. An average GDP growth of 2.0% could result in 0.9 TCF lower demand in 2010. If oil prices were $3.50 higher than assumed in the Reference Case, demand could increase by 0.7 TCF. Conversely, if oil prices were $3.50 lower, demand could be 1.0 TCF lower than the Reference Case.

The assumptions regarding other fuels that are used for electricity generation can also have a large impact on demand. For example, if the capacity utilization factor of coal-fired plants is 65% rather than the 75% assumed in this study, gas demand could increase by 1.7 TCF. If an additional 15 gigawatts of nuclear retirements were to occur, demand

could increase as much as 0.7 TCF. Further detail on these sensitivities is included in the Demand Task Group Report.

Demand Finding 3:
Environmental regulations could add significant incremental demand.

The potential 29 TCF demand projected for 2010 does not include the effect of environmental and other regulations that are not currently scheduled for implementation. New legislation or policy initiatives that might be implemented to address global climate change could substantially increase gas demand. For example, the Energy Information Administration (EIA) and the Edison Electric Institute (EEI) have conducted separate studies of the impact of meeting the U.S. target under the Kyoto protocol. These studies, which are discussed in the Demand Task Group Report, confirm that substantial reductions in coal and oil consumption would be required with a concomitant increase in gas demand. These studies examine various scenarios and indicate an increase in gas demand of 2–12% in the case of EIA, and 10–22% in the case of EEI above their respective reference cases.

While the 1999 NPC Study did not specifically analyze the effect of new environmental regulation, correlations can be made with other factors that affect demand and price. For example, the sensitivity analysis that examined a decrease in the utilization rate of coal-fired electricity generation capacity—which could easily occur with new environmental regulation—indicated that a significant corresponding increase in demand would occur.

Findings of the Supply Task Group

Supply Finding 1:
Sufficient resources exist to meet growing demand well into the twenty-first century.

The estimated resource base of 1,466 TCF for the lower-48 states in the 1999 Study represents a 171 TCF increase from the 1,295 TCF used in the 1992 Study (see Figure 4 and Table 3). In addition, Canada's resource base is estimated at 667 TCF. Canada's resource base is approximately 73 TCF lower than determined in the 1992 Study due to depletion and reassessment of nonconventional resources.

The Supply Task Group's team of industry experts on resource assessment conveys a high level of confidence in the robustness of the U.S. resource base. This team notes that the 171 TCF increase in the resource base has occurred despite production in the lower-48 states of 124 TCF of reserves from 1991 through 1997. The increase in the estimated resource base is primarily derived from technology improvements. For example, advances in computer technology have yielded breakthroughs in data processing, integration, and imaging, which have in turn vastly improved reservoir modeling. This information enables better projections of the size and location of hydrocarbon deposits. Technology has also played a significant role in improving drilling and completion techniques, thus improving access to the resource base. The major contributors to increases in the resource base are:

- **Old Field Reserve Appreciation.** The application of new technology has helped in the assessment of hydrocarbons in known fields. The new information has resulted in an increase of 69 TCF in the estimates of the resource base in "Old Fields."
- **New Fields Primarily in the Deepwater Gulf of Mexico.** New information and improved interpretations have also yielded increases in projections for New Fields—fields that are theoretically in place but are yet to be discovered. For example, estimates of New Fields resources in deepwater Gulf of Mexico have increased to 140 TCF, a 145% increase from the 57 TCF estimate in the 1992 Study.

Figures 17a and 17b show the U.S. and Canadian assessment regions and the "Assessed Additional Resources" for each region, which is the sum of Old Field growth, New Field discoveries, and nonconventional gas sources. Two areas, the Rocky Mountain Foreland and the Central and Western Gulf of

TABLE 3

U.S. AND CANADIAN NATURAL GAS RESOURCES
(Trillion Cubic Feet)

	1992 NPC Study* (1-1-91)	1999 NPC Study (1-1-98)
LOWER-48 RESOURCES		
Proved Reserves	160	157
Assessed Additional Resources	1,135	1,309
Old Fields (Reserve Appreciation)	*236*	*305*
New Fields	*493*	*633*
Nonconventional	*406*	*371*
Total Remaining Resources (Proved + Assessed Additional)	**1,295**	**1,466**
Cumulative Production	758	881
Total All-Time Recovery	2,053	2,347
ALASKAN RESOURCES†		
Proved Reserves	9	10
Assessed Additional Resources	171	303
Old Fields (Reserve Appreciation)	*30*	*32*
New Fields	*84*	*214*
Nonconventional	*57*	*57*
Total Remaining Resources (Proved + Assessed Additional)	**180**	**313**
Cumulative Production	5	9
Total All-Time Recovery	185	322
CANADIAN RESOURCES		
Proved Reserves	72	64
Assessed Additional Resources	668	603
Old Fields (Reserve Appreciation)	*24*	*22*
Discovered Undeveloped	*47*	*35*
New Fields	*379*	*384*
Nonconventional	*218*	*162*
Total Remaining Resources (Proved + Assessed Additional)	**740**	**667**
Cumulative Production	65	103
Total All-Time Recovery	805	770

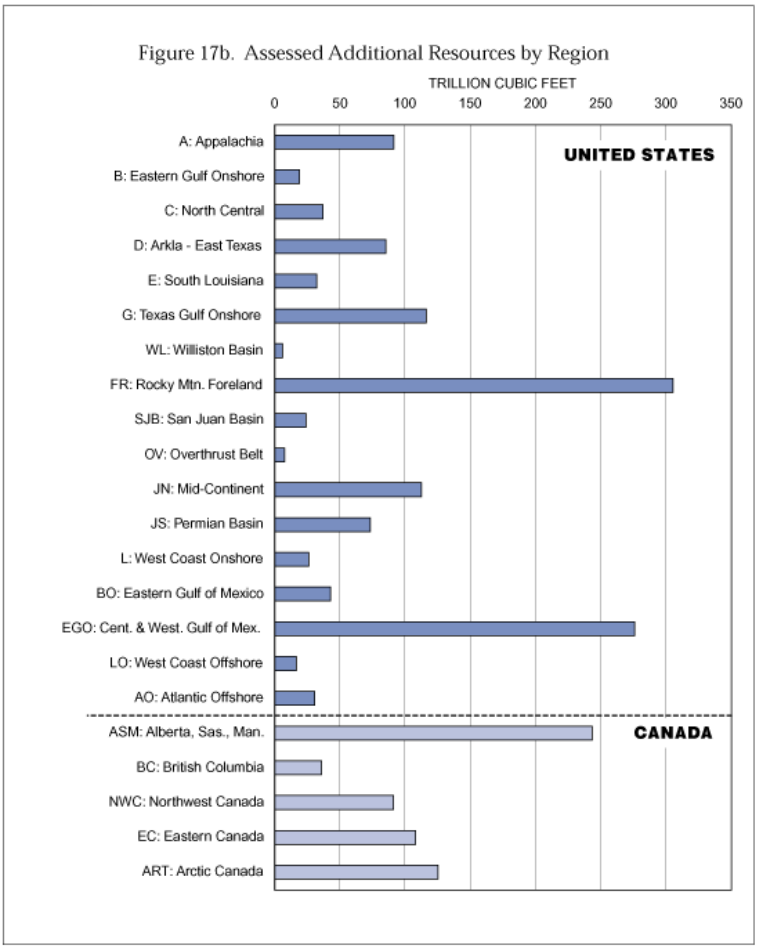
*Assessed Additional Resources from the 1992 Study reflect re-allocation of tight gas resources among categories consistent with 1999 Study allocations.

†Old Fields resource includes 25 TCF for Prudhoe Bay; New Fields resource is based on 1995 USGS/MMS assessment; and Nonconventional resource is PGC coalbed methane resource.

Figure 17a. U.S. and Canadian Assessment Regions



* Alaskan resources were not assessed in this study.


Figure 17b. Assessed Additional Resources by Region
TRILLION CUBIC FEET
0
50
100
150
200
250
300
350
A: Appalachia
B: Eastern Gulf Onshore
C: North Central
D: Arkla - East Texas
E: South Louisiana
G: Texas Gulf Onshore
WL: Williston Basin
FR: Rocky Mtn. Foreland
SJB: San Juan Basin
OV: Overthrust Belt
JN: Mid-Continent
JS: Permian Basin
L: West Coast Onshore
BO: Eastern Gulf of Mexico
EGO: Cent. & West. Gulf of Mex.
LO: West Coast Offshore
AO: Atlantic Offshore
ASM: Alberta, Sas., Man.
BC: British Columbia
NWC: Northwest Canada
EC: Eastern Canada
ART: Arctic Canada
UNITED STATES
CANADA

Mexico, contribute almost half of the U.S. total. In Canada, the Western Sedimentary Basin (model region ASM) will provide a significant amount of the additional resource.

U.S. gas production is projected to increase from 19 TCF in 1998 to 25 TCF in 2010 and could approach 27 TCF in 2015. Canadian imports to the United States are projected to increase from 3 TCF in 1998 to 3.8 TCF in 2010 and could reach 4.4 TCF by 2015 (Table 4). Approximately 13–14% of U.S. gas supply will continue to come from Canada. LNG imports will reach 0.9 TCF using an average of 75% of existing U.S. capacity. No additional import facilities are projected in this study. Exports to Mexico are projected to increase in the near term to 0.4 TCF and remain at that level throughout the study period.

Future production will be from deeper wells, deeper water, and more nonconventional sources. As Table 5 demonstrates, lower-48 production will gradually increase from deeper wells. Onshore production from depths below 10,000 feet is projected to increase from 33% in recent years to over 40% by 2010. The industry's ability to achieve production from deeper horizons will be dependent on the appropriate amount of deep drilling infrastructure and the continued evolution of technology.

In the Gulf of Mexico, production from deeper waters will be the driving force in future supply growth, as demonstrated in Table 6. Production from water depths of more than 200 meters is projected to increase from 0.8 TCF in 1998 to over 4.5 TCF in 2010 and maintain approximately that level

TABLE 4

U.S. GAS SUPPLY
(Trillion Cubic Feet)

	1998*	2005	2010	2015
U.S. Gas Production	19.0	22.6	25.1	26.6
Net Imports from Canada	3.0	3.7	3.8	4.3
LNG Imports	0.1	0.4	0.6	0.9
Exports to Mexico and Japan	-0.1	-0.4	-0.5	-0.5
Total Supply	**22.0**	**26.3**	**29.0**	**31.3**
Canada as a % of Total	14%	14%	13%	13%

*Historical data from Energy Information Administration, *Natural Gas Monthly*, September 1999. Data include synthetic natural gas.

TABLE 5

ONSHORE LOWER-48 GAS PRODUCTION BY DEPTH INTERVAL

	1998*	2005	2010	2015
0–5,000 ft	28%	27%	25%	25%
5–10,000 ft	39%	37%	34%	32%
10–15,000 ft	26%	26%	29%	32%
> 15,000 ft	7%	10%	12%	11%

*Energy and Environmental Analysis, Inc., estimates adapted from PI/Dwights production reports.

TABLE 6

GULF OF MEXICO PRODUCTION BY WATER DEPTH

	1998*	2005	2010	2015
Gulf of Mexico Production (TCF/Year)	5.3	7.4	8.0	7.6
Conventional Production (%)				
Shelf 0–40 meters	49%	27%	20%	19%
Shelf 40–200 meters	35%	24%	20%	17%
Slope 200–1,000 meters	14%	26%	25%	23%
Slope 1,000–1,500 meters	0%	9%	13%	14%
Slope >1,500 meters	1%	8%	15%	18%
Subsalt Production (%)				
Shelf 40–200 meters	< 1%	3%	4%	4%
Slope 200–1,000 meters	1%	2%	2%	3%
Slope >1,000 meters	0%	1%	1%	2%

*Energy and Environmental Analysis, Inc., estimates adapted from PI/Dwights production reports.

through 2015. Conversely, Gulf of Mexico shelf production is projected to decrease from 4.5 TCF in 1998 to 3.5 TCF in 2010 and around 3.0 TCF in 2015.

Growth in production from nonconventional sources will be especially pronounced in the Rocky Mountain region. Nonconventional production in this region is projected to increase from 1.9 TCF in 1998 to 2.9 TCF in 2010 and as much as 3.4 TCF in 2015. Production in the lower-48 states from nonconventional sources (i.e., the sum of tight gas, shales, and coalbed methane) accounted for 4.4 TCF of total production in 1998. This volume is projected to increase to 6.8 TCF in 2010 and could reach 8.5 TCF in 2015 (Table 7).

All of these new sources of gas require that significant technology hurdles be

TABLE 7

LOWER-48 PRODUCTION FROM CONVENTIONAL VS. NONCONVENTIONAL SOURCES

	1998*	2005	2010	2015
Associated Gas	14%	13%	14%	13%
High Permeability Gas	60%	62%	59%	54%
Tight Gas & Shale Gas	20%	20%	21%	25%
Coalbed Methane	6%	5%	6%	8%

*Energy and Environmental Analysis, Inc., estimates adapted from PI/Dwights production reports.

addressed and overcome in order to deliver cost-competitive supply. Two sensitivity cases were developed to determine the impact on price and demand if technology develops at either a slower rate or a faster rate. When technology improvements developed more slowly than in the Reference Case, demand in 2010 fell by 0.7 TCF and price increased by $0.27 per MMBtu. Conversely, when the rate of technology improvements increased, demand increased by 0.7 TCF, and price decreased $0.32 per MMBtu.

Sensitivity analyses were also run on the size of the resource base to evaluate the impact of learning more about the resource base. An increase of 250 TCF in the economically recoverable resource base, beyond the 1,466 TCF Reference Case estimate, resulted in a decrease in gas price of $0.96 per MMBtu. Conversely decreasing the estimate of the resource base by 250 TCF from the 1,466 TCF estimate, increased the price by $0.56 per MMBtu. The sensitivity analyses indicated that the assumption on the size of the estimated resource base has the highest impact on the ability to produce competitively priced natural gas. This sensitivity analysis provides some insight into the impact of access issues since access restrictions remove potential supply from the available resource base.

Supply Finding 2:
Restricted access limits the availability of supply.

Access issues limit the ability to reach known resources, slow down development in certain areas, and impede the construction of needed pipelines required to deliver natural gas to markets. For the purposes of the 1999 Study, the following assumptions were made with regard to access: (1) all scheduled lease sales will continue on time (including MMS Lease Sale 181 in the eastern Gulf of Mexico); (2) all existing regulatory requirements and restrictions on—and all current rights to drill on—public lands are honored; and (3) rights-of-way will be obtained for constructing and expanding any necessary pipeline infrastructure. If any of these assumptions fall short, the ability to explore for, produce, and deliver adequate supply will be hampered. Enabling access beyond that assumed in the Reference Case is necessary to improve availability and cost-competitiveness of gas supply in the time period of the 1999 Study.

Two areas that will significantly contribute to future gas supply are the Rocky Mountain region and the Gulf of Mexico, both of which have significant access restrictions. For example, approximately 9% of resource-bearing lands in the Rockies are completely inaccessible due to "no leasing" and "no surface occupancy" restrictions. Another 32% of resource-bearing lands are specifically subject to restrictions that delay development activity by an average of two years and add measurably to the cost of drilling wells on these properties. These restrictions mean that over 137 TCF of resources are subject to prohibitions or impediments. Another 76 TCF of resources are estimated for restricted offshore areas in the eastern Gulf of Mexico, the Atlantic, and the Pacific. Regardless of the lack of specific stipulations, nearly all public-lands acreage otherwise accessible for development regularly becomes encumbered to some degree in disputes among stakeholder groups and inconsistent application of regulatory policy by the governmental group(s) charged with managing these lands. These issues result in similar delays and added costs for offshore areas.

The 1999 Study assumes access to those tracts in planned MMS Lease Sale 181, but not the resources in the eastern Gulf of Mexico beyond the Norphlet Trend areas off Mississippi and Alabama. These areas have not been opened up and no plans to do so are currently in progress. Similarly, the Destin Dome area off the Panhandle of Florida was not assumed to be available for development in the Reference Case because the regulatory approval process was taking place during the time of this study.

Two sensitivity cases were developed to evaluate the impact of access on natural gas production. As seen in Table 8, the reduced access case assumed that further restrictions in the Rocky Mountain region would increase development costs and reduce the area that can be leased under standard terms. This case also assumed that the scheduled MMS Lease Sale 181 would not occur. The reduced access case resulted in a price increase of $0.16 per

TABLE 8

SUMMARY OF NPC FEDERAL LANDS AND WATERS ACCESS SENSITIVITIES

	Reference Case	Increased Access Case	Reduced Access Case
Rocky Mountains			
Standard Lease Terms	59%	59%	22%
Off Limits	9%	9%	14%
High Cost*	32%	32%	64%
*High Cost Penalty per Well	6% of Well Costs	0%	6% of Well Costs
*High Cost Delay	2 Years	None	2 Years
Eastern Gulf of Mexico			
Destin Dome	No Development	Production by 2002	No Development
MMS Lease Sale 181	Lease Sale in 2001	Lease Sale in 2001	No Sale
Non-Sale 181 Eastern Gulf	No Sale or Development	Lease Sale in 2004	No Sale or Development
Other Offshore U.S.			
Pacific	No Development	Lease Sale in 2004	No Development
Atlantic	No Development	Lease Sale in 2004	No Development

MMBtu in 2010 and a decrease in U.S. production of 0.5 TCF. The declines in production occurred primarily in the Rockies and the eastern Gulf of Mexico. The decrease in production in 2015 was 0.2 TCF, with a decrease in price of $0.08 per MMBtu. The changes that occurred in the reduced access sensitivity case were not pronounced, primarily because the access assumptions in the Reference Case were already very restrictive.

The second sensitivity case assumed that access restrictions would be relaxed in the Rockies, resulting in the elimination of high-cost delays. Currently restricted offshore areas were assumed to be open to leasing in 2004 and production from the area opened in MMS Lease Sale 181 would begin in 2002. This increased access case resulted in an increase in U.S. production of 0.5 TCF in 2010, 95% of which was in the Rockies and the eastern Gulf of Mexico. A corresponding decrease in price of $0.21 per MMBtu accompanied this production increase. More importantly, a dramatic shift occurred in the Extended View period with an increase in U.S. production in 2015 of 1.6 TCF. This increase continued to be primarily from the Rockies and the Eastern Gulf of Mexico, with some Atlantic offshore production beginning in this time frame. Prices in 2015 decreased by $0.45 per MMBtu.

Supply Finding 3:
A healthy oil and gas industry is critical for natural gas supply to satisfy expected increases in demand.

Adequate financial performance must be demonstrated to compete for and attract financial investment.

The growth in gas demand projected in the 1999 Study will require approximately $658 billion [constant 1998 dollars] in upstream capital expenditures from 1999 through 2015. This figure includes all exploration, development, production, and gathering capital expenditures. A summary of the capital investment requirements projected by the Reference Case in the 1999 to 2015 study period is shown in Figure 9.

This supply growth will require an increased annual average capital expenditure of $39 billion per year from 1999 through 2015, versus an annual average of $27 billion from 1991 through 1998. However, these needed levels of investment will take place only if investors have confidence that competitive rates of return will be earned. In recent years, this has not been the case as the U.S. upstream sector has earned very modest rates of return. According to the Financial Reporting System, the 23 largest producers reported an average return on assets of just 5.4% over the 12-year period from 1986 through 1997.

The assumption for future oil prices in the 1999 Study does not take into account the price volatility that has been experienced and that has caused difficulty in maintaining steady levels of upstream investments. The strong direct correlation between commodity prices and upstream investment means that investments drop rapidly following a significant downturn in oil or gas prices and confidence returns slowly. The historical low rates of return and the degree of volatility jeopardize the steady flow of capital that is needed to achieve the large projected increases in gas production required to meet growing demand.

Aggressive pro-active workforce planning is essential.

Without immediate action, impending shortages of qualified personnel are expected to hinder the ability of the supply sector to find and develop the required gas supply. Three major shocks to employment prospects in the producing sector have occurred in the last 20 years. Each of these shocks (1982, 1986, and 1998) was caused by drastic declines in the world market price of crude oil and resulted in significant reductions in expenditures and jobs. At the same time, companies dramatically decreased hiring rates. As a result, the producing sector now suffers from a very slim "bench" of mid-career workers between the ages of 30 and 40 and is facing a large wave of retirements.

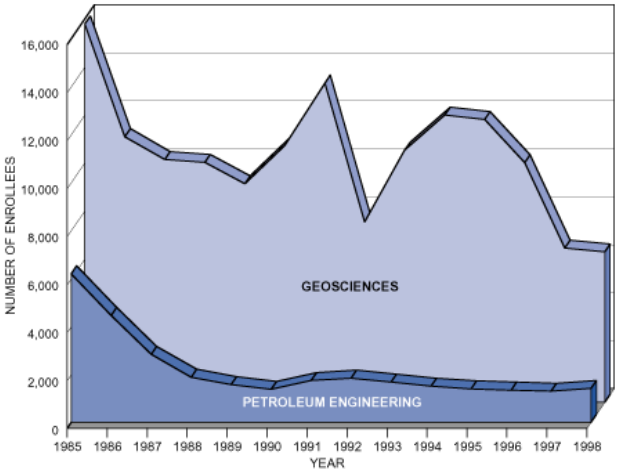
In the aftermath of precipitous declines in crude oil prices in 1981, enrollments in key disciplines that support the producing sector began to decline drastically and gained momentum with the equally devastating oil price drop in 1986. The "farm clubs"—college and university petroleum-related degree programs—continue to have great difficulty attracting promising high school seniors. Enrollments in undergraduate petroleum engineering and geoscience programs have declined by 77% and 60%, respectively, between 1985 and 1998 (see Figure 18).[2]

The oilfield service/supply sector faces similar challenges in meeting engineering and operations requirements. Volatility in the drilling industry has caused many toolpushers and other key supervisory personnel to leave the industry in search of more stable careers. Industry contractors will be challenged to find and train adequate numbers of skilled laborers, such as machinists, electricians, pipefitters, and welders. Higher wage scales are likely to be required to attract workers back into the industry.

Beginning immediately, aggressive pro-active workforce planning is a necessity for producers and contractors to achieve staffing levels that are necessary to meet the challenge of the projected demand increase.

[2] Data from (1) *Petroleum Engineering and Technology Schools 1997-1998*, Society of Petroleum Engineers http://www.pe.ttu.edu/spe_schools_book/html/school.html, (2) *State of Oil and Natural Gas Industry*, Independent Petroleum Association of America, August 4, 1999.

Figure 18. Geoscience Undergraduate and Petroleum Engineering Enrollees



Source: Society of Petroleum Engineers, *Petroleum Engineering and Technology Schools 1997-1998;* and American Geological Institute.

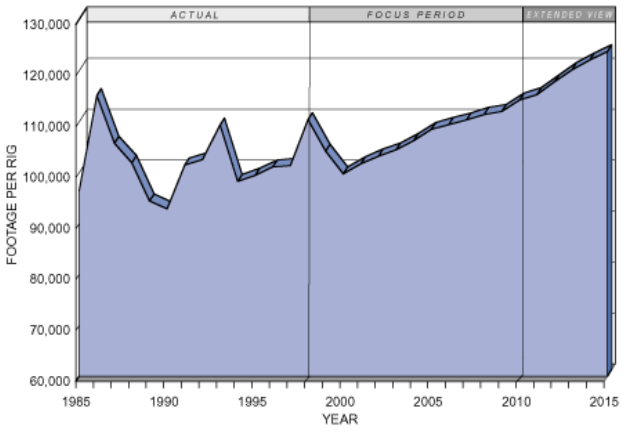
New drilling rigs must be built.

In order to supply the volume of natural gas needed through this study period, the total number of wells drilled annually must increase from 24,000 in 1998 to 37,000 in 2010 and as high as 48,000 by 2015. The well counts include both gas and oil wells because approximately 14% of natural gas produced in the United States is associated gas. In 1998, an average of just over 1,250 onshore rigs of the 1,700 rigs available have been active. While rig efficiency (footage drilled per rig, see Figure 19) has improved since 1985 and is expected to continue to improve over time with technology advancements, increased well depth requirements will likely cause the current number of actual wells drilled each year per active rig to remain relatively constant. Thus, to drill 48,000 wells annually by 2015 an average of 2,100 onshore rigs and 180 offshore rigs will be required to actively drill each month of the year.

With this increased level of drilling, the availability of drilling rigs becomes a primary concern. Over the 1999–2015 time frame, the number of onshore rigs that will be retired or lost to attrition is estimated at 90% of the current fleet. In order to meet estimated rig demand, over 1,125 onshore rigs would need to be constructed by 2010 and as many as 1,894 by 2015. Onshore rig construction will be needed as early as 2001. Capital requirements for onshore rig construction is projected at $12 billion.

Additional offshore drilling rigs will also be needed in this time frame, as shown in

Figure 19. Annual Average Footage Drilled Per Rig



Source of historical data: American Petroleum Institute, *Quarterly Completion Report;* and Baker Hughes, Inc., *Rotary Rigs Running.*

TABLE 9

GULF OF MEXICO DRILLING RIG INVENTORY

	Total	Marketed	Contracted	Not Marketed
Jack-up	*139*	*119*	*105*	*20*
Semis	*38*	*34*	*27*	*4*
Drillships	*3*	*3*	*3*	*0*
Submersibles	*7*	*1*	*1*	*6*
Total Mobile	187	157	136	30
Platform	78	57	37	21
Inland Barges	95	70	34	25
All Offshore	**360**	**284**	**207**	**76**

Source: Offshore Data Services, *Rig Locator,* September 24, 1999.

Table 9. As of September 24, 1999, the offshore fleet actively drilling in the Gulf of Mexico numbered 207, with 30 of those working in deepwater. Included in that total were 76 rigs that were not being marketed. Some of the rigs in this category might not be returned to service due to the costs that would be associated with meeting U.S. Coast Guard certification requirements and classification society standards. Since offshore drilling rigs are mobile, improved market conditions in the Gulf of Mexico could potentially attract rigs to relocate from foreign waters. Taking into account increasing drilling efficiencies as well as annual attrition rates of 5% for deepwater rigs and 7% for all others, the 1999 Study projects that 72 additional rigs—either reactivated, new construction, or relocations—will be needed by 2015 for the increased offshore activity. This total includes 10 deepwater rigs, 32 platform rigs, and 30 jack-up rigs and barges. If all of these additions were met by new construction, capital requirements would be approximately $7 billion.

Supply Finding 4:
Investment in research and development is needed to maintain the pace of advancements in technology.

As stated earlier, technology advancement has played a major role in the increase of the North American resource base by:

- Improving efficiency of drilling, equipment, operating, and other costs
- Increasing recovery factors of discovered oil and gas in place
- Improving success rates (i.e., reducing the number of dry holes)
- Revealing new areas and types of resources for exploitation through innovative geologic and engineering concepts.

The above improvements occurred mainly due to advances in 3D seismic, directional drilling, and improved completion techniques.

Information and communications technology also has had a widespread impact on all facets of the natural gas producing sector. The persistent improvement of computing power at consistently decreasing prices has placed increasingly powerful information technology tools in the hands of even the smallest producers, improving efficiency and reducing cost structures. Processing power is growing and allowing applications to be moved from mainframes to high-efficiency workstations. The advent of object-based and improved data storage technologies have allowed greater access to data with a high level of access in user friendly interfaces. Connectivity has been enhanced by the use of high-capacity networks, fiber, and satellite communication links, and the Internet (intranets, extranets, etc.). More importantly, these types of system advances support new paradigms of multi-disciplinary teaming.

One consideration in this constantly changing environment and workstyle is the manner in which people can adapt, modify work processes, and comfortably utilize these tools. These changes challenge management to ensure that training is constantly updated to match the fast pace of technology growth.

Advances in technology do not happen in a vacuum. All industry stakeholders will have to support continued investment in technology research and development—from the producer who must apply the newest tools/techniques to the next opportunity, to the investor who must at times be willing to sacrifice immediate gains for longer-term viability. Continued and increased funding of research and development is required for the North American resource base to live up to its potential. Cooperative measures by all parties will be required. With continued emphasis and investment, new technologies such as those listed below could have a significant impact on future gas production:

- **Improved Seismic Techniques.** Time-lapse seismic reservoir monitoring, commonly known as 4D seismic, is the comparison of 3D seismic surveys acquired at two or more points in time. This allows scientists to study the movement of fluids in the reservoir. Another technique, multi-component technology, provides a more detailed picture of a subsurface reservoir's internal architecture. The combination of these two technologies

with visualization technology allows geoscientists to "see" reservoir events such as a gas cap enlarging as oil is produced. In the future, real-time reservoir models will use these techniques to allow quick updating as new data are available, thus enabling drilling and field development decisions to be made quickly to enhance production.

- **Deep Wireline Measurements.** Deep measurements of gravity and electromagnetic forces provide information that complements the seismic data. Wireline-based deep measurements typically have higher resolution than seismic and can provide enhanced detail about gas location and movement.
- **Integrated Well Planning.** Integrated well planning is the process of effectively and accurately planning for optimum wellbore placement in the reservoir, determining suitable equipment/systems for completion and production, and maximizing reservoir output and economics.
- **Drilling Systems.** A major focus on drilling systems will continue, because drilling time is a major component of rig cost and thus the total cost of the well. Significant strides have been made in the last several years with regard to rates of penetration, equipment dependability, downhole data gathering, and drilling dynamics. The ability to steer and extend the wellbore both vertically and horizontally to zones of interest has increased significantly with the advent of extended reach wells, horizontal drilling, and multi-laterals
- **Deepwater Technology.** As exploration and production activities move deeper into the ocean, new technology will be essential for advancing offshore production systems. Traditional platforms are being replaced with new designs and subsea completions are becoming common place. New systems such as Floating Production Systems may have the potential to significantly extend producing systems to the ultra-deepwater areas if technology and cost challenges can be met.

The 1999 Study presumes that these technology advances and many others will form the basis for new innovations that increase exploratory success and optimize well production capability. Should technology advancements materialize at a slower rate, or should these technologies prove less valuable to producers than expected, the availability of future supply and the cost at which it is delivered could be impacted.

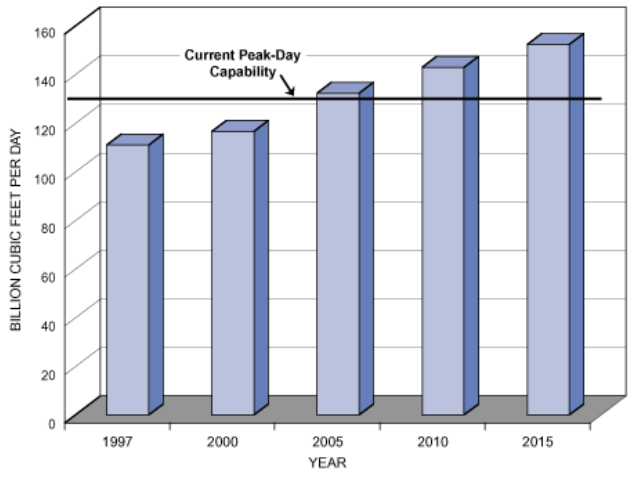
Findings of the Transmission & Distribution Task Group

Transmission/Distribution Finding 1: Significant expansion and enhancements to the delivery system are required to serve the growing demand.

Substantial changes are expected in natural gas supply and consumption patterns by 2015, which creates a need for enhancements to the existing delivery system and construction of new transmission and storage facilities. By 2015, annual requirements are projected to increase beyond 31 TCF, which equates to 88 BCF per day. Peak-day requirements will grow from approximately 111 BCF per day in 1997 to over 152 BCF per day in 2015, as shown in Figure 20. A significant investment in pipeline facilities will be necessary to meet the new demand requirements and shifts in supply locations to deepwater Gulf of Mexico, Rockies, western Canada, and the Canadian Atlantic. These frontier supply basins will have increased pipeline costs because of their more distant location from markets, mitigation of potential environmental impacts, and harsher environments for construction, maintenance, and operation. However, the annual average expenditures projected in this study are consistent with historical trends.

The consumption of natural gas in the United States previously peaked in 1972 at 22.1 TCF. Since then, geographic shifts in supply and demand (such as the decline of the industrial Midwest and increases in supply

Figure 20. Peak-Day Demand by Year



Source: EEA, Inc., Gas Market Data and Forecasting System.

from the Rockies and Canadian imports) has caused the transmission and storage system to expand more slowly than otherwise expected. Today there are more than 270,000 miles of gas transmission pipelines and approximately 3.2 TCF of working gas storage capacity (Figures 21 and 22). The U.S. delivery system also includes another 952,000 miles of gas lines owned by the distribution segment of the industry. Through 2015, approximately 38,000 miles of transmission pipeline and 255,000 miles of distribution mainlines are projected to be needed to meet the requirements of the projected market. This rate of growth is comparable to the expansion experienced in the last few years. In addition, working gas storage will increase by 0.8 TCF.

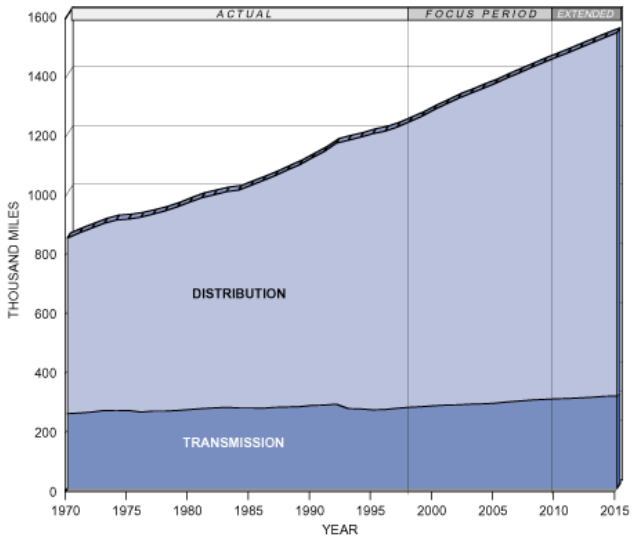
The existing transmission and storage system is capable of meeting its existing firm requirements on an annual and peak-day basis. Analysis indicates that the system had a 1997 annual capacity of 45 TCF and a daily capacity of 131 BCF. This additional capacity above the 1998 annual consumption of 22 TCF, and estimated firm peak-day demand of 111 BCF per day, allows non-firm customers to use this capacity on peak days, provides necessary redundancy, adds reliability, and enables the system to support a growing U.S. gas market.

Peak-day requirements represent the sum of all loads on a system on the day of highest demand (as measured by volume). Any particular system must have the ability to meet its customers' firm requirements on design peak days. Gas utility systems use a combination of flowing gas and storage gas to meet their customers' firm requirements on these days.

The space-heating load is highly dependent on the impact of unpredictable winter weather. For this reason, almost all U.S. gas pipelines and distribution companies experience their peak day during the winter months. During the remaining months of the year, these utilities have unutilized capacity beyond that needed to meet market requirements and to refill storage.

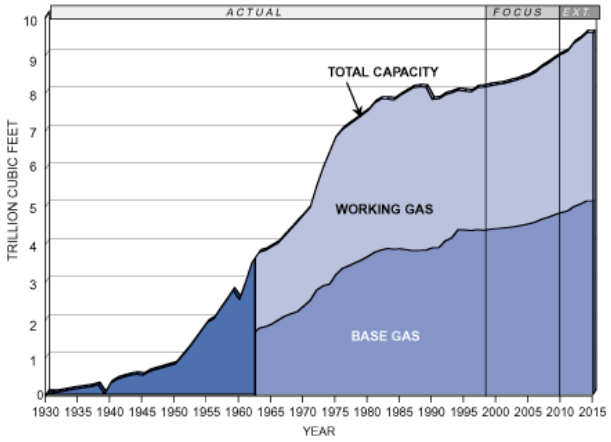
In general, the increased demand projections for 2010 and 2015 in the residential, commercial, and industrial sectors will also increase peak-day requirements and thus necessitate construction of additional pipeline and storage facilities. Contracts with some customers, principally industrials and electricity generators, may limit consumption on peak days and allow (or require) them to switch to another fuel. Some customers are unable to switch fuels due to restrictions from environmental regulations. This is becoming more common, particularly for the new electricity generation facilities, as fuel-switching capabilities are becoming more difficult to permit in some areas of the United States. Thus, the new electricity generation load will likely have a higher impact on peak-day requirements than in the past. However, some level of fuel-switching capability is necessary to handle overall energy needs on peak days and to lessen pipeline and storage expansion needs.

Figure 21. U.S. Natural Gas Pipeline Cumulative Mileage



Source of historical data: American Gas Association, *1998 Gas Facts.*

Figure 22. Underground Natural Gas Storage Capacity



NOTE: Prior to 1962, storage data not distinguished between Base Gas and Working Gas.

Sources: Total Capacity: American Gas Association, Engineering Technical Note, *Underground Storage in the U.S. and Canada–1990*, April 1991.
Base Gas: Energy Information Administration, *Annual Energy Review 1990*, p. 175.
Working Gas = Total minus Base.

Two shifts in the flows on the transmission system have developed recently. The first is the decrease in Gulf Coast and Mid-Continent supply moving to the Midwest (i.e., Chicago area). This was caused by slow market growth in the Midwest and displacement of Gulf Coast and Mid-Continent supply by Rockies and western Canadian supply as additional pipeline infrastructure has come on line. The second is the increase in Gulf Coast supply to the Southeast that was caused by the large increase in market demand. Supply increases from the Rockies and western Canada will be landing in the Midwest area, turning Chicago into a supply hub at some point in the near future. The Reference Case shows that significant new or incremental transmission capacity will be built from the Rockies to California, Canadian Atlantic to New England, Gulf of Mexico to Florida, western Canada to the Pacific Northwest, and the Mackenzie Delta to Alberta.

Transmission/Distribution Finding 2: Access issues impede installation of new infrastructure.

The anticipated shifts in supply regions and regional growth patterns will require building pipelines to tap new supply sources, expanding infrastructure along existing corridors, building laterals to attach new markets, and attaching new storage facilities to the pipeline grid. A fundamental requirement to develop this infrastructure is access to land for attaching, gathering, and processing the natural gas and then transporting the natural gas

to market or to storage fields for eventual delivery to market.

Issues related to access have become more prominent for the transmission and distribution sectors of the industry. Access issues arise from urban sprawl encroaching on potential and existing rights-of-way and eliminating potential pipeline routes, heightened public resistance to providing easements, and increasingly restrictive government policies and regulations. Some of these issues are exemplified by public protest to recently proposed pipeline projects from the Midwest to serve Northeast markets. Both industry and government have taken action to address the public's concerns. For example, FERC recently amended regulations by adding landowner notification requirements and also issued orders to help facilitate pipeline projects. However, the following examples of proposed policy/regulatory changes demonstrate a movement toward additional requirements for the building and maintenance of pipelines.

- The U.S. Fish & Wildlife Service (FWS) has developed a "Draft Compatibility Policy Pursuant to the National Wildlife Refuge System Act of 1997" that would significantly impact the ability to obtain permits from the FWS for non-wildlife-dependent activities.
- On July 21, 1999, the Corps of Engineers proposed to modify Nationwide Permits in certain areas, which if implemented could affect the ability to obtain permits in a timely and cost-effective manner.
- On September 15, 1999, the Federal Energy Regulatory Commission issued a Statement of Policy (Docket No. PL99-3-000) that it will use in deciding whether to authorize the construction of major new pipeline facilities. The change in policy now requires that an applicant demonstrate that the economic benefits to the public outweigh adverse impacts. Only when the benefits outweigh the adverse effects on economic interests will the Commission proceed to complete the environmental analysis and consider other interests. Prior to this policy change the economic test was much simpler, relying on the percentage of long-term contracts as the measure of demand for a proposed project.

Careful consideration must be given to these and similar issues in order to balance the myriad of interests that exist. The consequences of conflicting policy and regulations within and across government agencies will lead to higher costs, either directly or via delays. Natural gas has its own environmental benefits that should be taken into account when formulating policy so that an appropriate balance can be achieved.

Transmission/Distribution Finding 3: New services are needed to serve a changing market.

The evolving competitive nature of the natural gas industry requires new mechanisms for existing and new customers to gain access to transportation services at competitive prices. As the LDCs' requirements to hold interstate pipeline capacity decline, marketers, producers, and other end-users will be contracting for the capacity. Many of these customers use capacity differently than the LDCs, because their individual load requirements and physical capabilities differ from the aggregated load and system capabilities of the LDCs.

The current delivery system was built and optimized over decades to meet the design peak-day requirements of firm service customers that are primarily residential, commercial, and to a lesser extent, industrial and electricity generation customers. To date, the "seasonal slack or off-peak slack" in the delivery system has been adequate to meet the levels of demand placed on this system by electricity generators. Looking ahead, the anticipated tremendous growth in electricity generation demand for natural gas will require the delivery system to be re-optimized to meet larger off-peak swing loads as well as growing peak-day requirements. For example, electricity generators (using high-efficiency combustion turbines) require significantly higher inlet pressures and higher hourly flow rates than other end-use customers (and previous generation turbines). In addition, the loads for peaking generators are volatile and of relatively short duration, thereby requiring

greater flexibility and quicker responses by the natural gas delivery system. Meeting these requirements, as well as the increasing peak-day requirements of the other sectors, on a significantly larger scale will entail changes in physical capabilities, operational procedures, communications, contracting (supply and transportation), and tariffs.

Transmission/Distribution Finding 4: The restructured market changes the risks associated with investments for new infrastructure.

While the capital required for transmission and distribution infrastructure expansions is not of the same magnitude as for the upstream sectors, investment issues are just as critical. The Reference Case shows that transmission and distribution companies will need to make capital investments of approximately $123 billion through 2015. This total includes $35 billion for transmission pipelines, $84 billion for distribution facilities, and $4 billion for storage. Clearly, companies will need to make considerable investments in infrastructure to serve new customers, manage seasonal and peak-day demand swings, and replace aging facilities. The magnitude of the expenditures is in line with historical averages, but restructuring has introduced new risks associated with investments.

The primary question that looms in this segment of the industry is about who will accept the risk of financing and constructing major new facilities. In the past, downstream investments in gas pipelines and storage fields were heavily regulated. LDCs, as franchise holders, had principal access to the end-use market and thus had a level of certainty that supported the investment in new facilities. The industry restructuring over the last two decades has led to changing roles and obligations—as well as new risks and different risk profiles—for all the industry participants. Many pipeline shippers now attach little value to holding contracts for firm service of more than three years. The shippers' need to limit their long-term exposure does not align with the pipelines' need for long-term contract commitments to justify investment risk. In addition, industry restructuring can impose a myriad of challenges/risks to gas utilities that should be considered in the regulatory process. Faced with these changing conditions, it is not clear who will be willing to accept the risks for building the infrastructure needed to support the growth in natural gas demand.

APPENDICES

Appendix A
Request Letters
and
Description of the
National Petroleum Council

Appendix B
Study Group Rosters

The Secretary of Energy
Washington, DC 20585
May 6, 1998

Mr. Joe B. Foster
Chair
National Petroleum Council
1625 K Street, N.W.
Washington, D.C. 20006

Dear Mr. Foster:

In 1992, the National Petroleum Council released a study entitled, "Potential of Natural Gas in the United States." That study was critical in identifying natural gas as an abundant domestic resource that can make a significantly larger contribution to both this Nation's energy supply and its environmental goals.

Since the release of the study, the Nation has experienced five years of sustained growth in the use of natural gas. In addition, the study did not anticipate at least two major forces that are beginning to take shape, which will profoundly affect energy choices in the future -- the restructuring of electricity markets and growing concerns about the potentially adverse consequences that using higher carbon-content fuels may have on global climate change and regional air quality. These issues offer opportunities and challenges for our Nation's natural gas supply and delivery system. For a secure energy future, Government and private sector decision makers need to be confident that industry has the capability to meet potentially significant increases in future natural gas demand.

Accordingly, I am requesting that the Council reassess its 1992 study taking into account the past five years' experience and evolving market conditions that will affect the potential for natural gas in the United States to 2020 and beyond. Of particular interest is the Council's advice on areas of Government policy and action that would enable natural gas to realize its potential contribution toward our shared economic, energy, and environmental goals.

Given the significance of this request, Deputy Secretary Elizabeth Moler will co-chair the study committee. I offer my gratitude to the Council for its efforts since our meeting in December 1997, to assist the Department in defining a more concise study scope. The breadth of issues related to natural gas supply and demand is vast and I recognize that further refinements in scope may be necessary once the study is underway to address the most significant concerns about future natural gas availability.

Sincerely,

Federico Peña

The Secretary of Energy
Washington, DC 20585

November 18, 1998

Mr. Joe B. Foster
Chair
National Petroleum Council
1625 K Street, N.W.
Washington, D.C. 20006

Dear Mr. Foster:

This is to convey my approval to establish a Committee on Natural Gas and to appoint industry members as proposed in your letter of October 6, 1998. I also approve the establishment of a coordinating subcommittee and the appointment of subcommittee members identified in your letter.

The Deputy Secretary will serve as the Government co-chair of the committee; the Assistant Secretary for Fossil Energy will co-chair the coordinating subcommittee. Staff involved in this study will be from the Office of Fossil Energy and the Office of Policy and International Affairs. In addition, the Energy Information Administration has expressed an interest in providing technical and analytic support. The Deputy Assistant Secretary for Natural Gas and Petroleum Technology will serve as the alternate for the Government co-chair of the subcommittee.

I agree that it would be appropriate for a representative of the Department of the Interior to be a member of the coordinating subcommittee, and we are pursuing this issue.

For a secure energy future, Government and private sector decision-makers need to be confident that industry has the capability to meet the significant increases in natural gas demand forecasted for the twenty-first century. I am pleased that the National Petroleum Council recognizes the challenge facing the domestic natural gas industry and has agreed to conduct a study of natural gas supply availability. I look forward to the study's results.

Yours sincerely,

Bill Richardson

Bill Richardson

Description of the National Petroleum Council

In May 1946, the President stated in a letter to the Secretary of the Interior that he had been impressed by the contribution made through government/industry cooperation to the success of the World War II petroleum program. He felt that it would be beneficial if this close relationship were to be continued and suggested that the Secretary of the Interior establish an industry organization to advise the Secretary on oil and natural gas matters.

Pursuant to this request, Interior Secretary J. A. Krug established the National Petroleum Council on June 18, 1946. In October 1977, the Department of Energy was established and the Council was transferred to the new department.

The purpose of the NPC is solely to advise, inform, and make recommendations to the Secretary of Energy on any matter, requested by the Secretary, relating to oil and natural gas or the oil and gas industries. Matters that the Secretary of Energy would like to have considered by the Council are submitted in the form of a letter outlining the nature and scope of the study. This request is then referred to the NPC Agenda Committee, which makes a recommendation to the Council. The Council reserves the right to decide whether it will consider any matter referred to it.

Examples of recent major studies undertaken by the NPC at the request of the Secretary of Energy include:

- *Enhanced Oil Recovery (1984)*
- *The Strategic Petroleum Reserve (1984)*
- *U.S. Petroleum Refining (1986)*
- *Factors Affecting U.S. Oil & Gas Outlook (1987)*
- *Integrating R&D Efforts (1988)*
- *Petroleum Storage & Transportation (1989)*
- *Industry Assistance to Government (1991)*
- *Short-Term Petroleum Outlook (1991)*
- *The Potential for Natural Gas in the United States (1992)*
- *U.S. Petroleum Refining—Meeting Requirements for Cleaner Fuels and Refineries (1993)*
- *The Oil Pollution Act of 1990—Issues and Solutions (1994)*
- *Marginal Wells (1994)*
- *Research, Development, and Demonstration Needs of the Oil and Gas Industry (1995)*
- *Future Issues—A View of U.S. Oil & Natural Gas to 2020 (1995)*
- *Issues for Interagency Consideration—A Supplement to the NPC's Report: Future Issues (1996)*
- *U.S. Petroleum Product Supply—Inventory Dynamics (1998).*

The NPC does not concern itself with trade practices, nor does it engage in any of the usual trade association activities. The Council is subject to the provisions of the Federal Advisory Committee Act of 1972.

Members of the National Petroleum Council are appointed by the Secretary of Energy and represent all segments of the oil and gas industries and related interests. The NPC is headed by a Chair and a Vice Chair, who are elected by the Council. The Council is supported entirely by voluntary contributions from its members.

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Acronyms and Abbreviations

AECO	Alberta Energy Company
AGA	American Gas Association
API	American Petroleum Institute
BCF	billion cubic feet
BCF/D	billion cubic feet per day
BLM	Bureau of Land Management
BOE	barrels of oil equivalent
Btu	British thermal unit
CDD	cooling degree days
D&C	drilling and completion (costs)
DOE	Department of Energy
E&P	exploration and production
EEA	Energy and Environmental Analysis, Inc.
EEI	Edison Electric Institute
EIA	Energy Information Administration
EPA	Environmental Protection Agency
ERM	Enhanced Recovery Module of the Hydrocarbon Supply Model
EUR	Estimated Ultimate Recovery
FERC	Federal Energy Regulatory Commission
GDP	gross domestic product
GOM	Gulf of Mexico
GRI	Gas Research Institute
GW	gigawatts
HDD	heating degree days
HSM	Hydrocarbon Supply Model
IPP	independent power producer
KWH	kilowatt-hours
LDC	local distribution company
LNG	liquefied natural gas
LPG	liquefied petroleum gas
MCF	thousand cubic feet
MMBtu	million British thermal units
MMCF	million cubic feet
MMS	Minerals Management Service
MW	megawatts

NERC	North American Electric Reliability Council
NOAA	National Oceanic and Atmospheric Administration
NPC	National Petroleum Council
NRC	Nuclear Regulatory Commission
NUG	non-utility generation
NYMEX	New York Mercantile Exchange
OCS	Outer Continental Shelf
PGC	Potential Gas Committee of the Colorado School of Mines
R&D	research and development
RACC	Refiner Acquisition Cost of Crude in the United States
SNG	synthetic natural gas
TCF	trillion cubic feet
USGS	United States Geological Survey
WTI	West Texas Intermediate crude oil



Glossary

Access
The legal right to build transmission and distribution facilities on public and/or private land.

AECO (Alberta Energy Company)
Natural gas pricing point in Alberta, Canada.

Assessed Additional Resources
The sum of natural gas deposits estimated to be in-place (using accepted engineering models and analytical tools) that will become recoverable in the future at various assumed technology and price levels; current economic and operating conditions are insufficient to justify Proved Reserves status for this category.

Basis
The difference in price for a commodity at two different geographical locations. For natural gas, basis has meant the difference between the NYMEX futures contract at Henry Hub and the cash price at other market points. For natural gas, basis reflects the value of transportation costs, although regional supply and demand factors are also important. In the model analysis, it is the difference in gas prices between any two nodes at the same instant in time.

Brownfield Pipeline
Adding compression and/or looping to add capacity to an existing pipeline.

Capacity, Peaking
The capacity of facilities or equipment normally used to supply incremental gas or electricity under extreme demand conditions. Peaking capacity is generally available for a limited number of days at maximum rate.

Capacity, Pipeline
The maximum throughput of natural gas over a specified period of time for which a pipeline system or portion thereof is designed or constructed, not limited by existing service conditions.

City Gate
The point at which interstate and intrastate pipelines sell and deliver natural gas to local distribution companies.

Cogeneration
The sequential production of electricity and useful thermal energy from the same energy source. Natural gas is a favored fuel for combined-cycle cogeneration units, in which waste heat is converted to electricity.

Commercial
A sector of customers or service defined as non-manufacturing business establishments, including hotels, motels, restaurants, wholesale businesses, retail stores, and health, social, and educational institutions.

Compression
Natural gas is compressed during transportation and storage. The standard pressure that gas volumes are measured at is 14.7 pounds per square inch (psi). Pipelines have compression stations installed along the line (one about every 100 miles) to ensure that the gas pressure is maintained while the gas is being transported. Current pipelines can carry compressed natural gas at nearly 1,500 psi, but most tend to operate at closer to 1,000 psi.

Cost of Service
The total amount of money, including return on invested capital, operation and maintenance costs, administrative costs, taxes, and depreciation expense, to provide a utility service.

Cubic Foot
The most common unit of measurement of gas volume; the amount of gas required to fill a volume of one cubic foot under stated conditions of temperature, pressure, and water vapor.

Cumulative Production
The total volume of natural gas that has been withdrawn from producing reservoirs.

Delivery Point
A point on a pipeline's system at which it delivers natural gas that it has transported. The city gate is the most common delivery point for a pipeline or transportation company because this is where the gas is transferred to the LDC.

Distribution Line
Network-like pipeline that transports natural gas from a transmission line to an end-user's service line or to other distribution lines. Generally, large pipelines are laid in principle streets, with smaller lateral lines extending along side streets and connected at their ends to form a grid; sometimes lateral lines are brought to a dead end.

Electric
A sector of customers or service defined as generation, transmission, distribution, or sale of electric energy.

Electric Day
An arbitrary 24-hour period of time established by an electric utility for the operation of its system, usually beginning at midnight.

End-User
One who actually consumes energy, as opposed to one who sells or re-sells it.

FERC (Federal Energy Regulatory Commission)
The federal agency that regulates interstate gas pipelines and interstate gas sales under the Natural Gas Act.

Firm Customer
A customer who has contracted for firm service.

Firm Service
Service offered to customers under schedules or contracts that anticipate no interruptions, regardless of class of service, except for force majeure.

Fuel-Switching
Substituting one fuel for another based on price and availability. Large industries often have the capability of using either oil or natural gas to fuel their operation and of making the switch on short notice.

Fuel-Switching Capability
The ability of an end-user to readily change fuel type consumed whenever a price or supply advantage develops for an alternative fuel.

Gas Day
An arbitrary 24-hour period of time established by a pipeline for the operation of its system, often beginning at seven or eight o'clock in the morning.

Greenfield Pipeline
Development of a new pipeline.

Henry Hub
A pipeline interchange near Erath, Louisiana, where a number of interstate and intrastate pipelines interconnect through a header system operated by Sabine Pipe Line. The standard delivery point for the New York Mercantile Exchange natural gas futures contract.

Industrial
A sector of customers or service defined as manufacturing, construction, mining, agriculture, fishing, and forestry.

Interruptible Customer
A customer who does not have firm service.

Interruptible Service
Gas sold to customers with a provision that permits curtailment or cessation of service at the discretion of the supplier under certain circumstances, as specified in the service contract.

Load Duration Curve
A curve of loads, plotted in descending order of magnitude, against time intervals for a specified period. The curve indicates the period of time load was above a certain magnitude. Load duration curves are profiles of system demand that can be drawn for a period of time (daily, monthly, yearly).

Load Factor
The ratio of average load to peak load during a specified period of time, expressed as a percent. The load factor indicates to what degree pipeline capacity has been utilized relative to total system capability.

Local Distribution Company
A company that obtains the major portion of its natural gas revenues from the operations of a retail gas distribution system and that operates no transmission system other than incidental connections within its own or to the system of another company.

Looping
Adding extra segments of pipe to add capacity to an existing pipeline.

Mains, Distribution
Pipes transporting gas within service areas to the point of connection with the service pipe.

Marketer (natural gas)
A company, other than the pipeline or LDC, that buys and resells gas or brokers gas for a profit. Marketers also perform a variety of related services, including arranging transportation, monitoring deliveries and balancing. An independent marketer is not affiliated with a pipeline, producer or LDC.

Mid-Continent
Natural gas pricing point for the Kansas/Oklahoma region.

New Fields
A quantification of resources estimated to exist outside of known fields on the basis of broad geologic knowledge and theory; in practical terms, these are statistically determined resources likely to be discovered in additional geographic areas with geologic characteristics similar to known producing regions, but which are as yet untested with the drillbit.

Nominal Dollars
Dollars that have not been adjusted for inflation.

Nonconventional Gas
Resources that are estimated to be contained in known strata of deposits requiring application of technologies different from those required to extract conventional high permeability gas reserves (i.e., shale gas, coalbed methane, tight gas, etc.).

Old Field Reserve Appreciation
Additional estimated conventional resources resulting from the recognition that currently booked Proved Reserves are conservative by definition and will continue to grow over time; based on historical experience, existing fields have been shown regularly to contain, and ultimately produce, significant additional quantities of natural gas in excess of initial proved reserve estimates.

Opal
Natural gas pricing point in Wyoming for the Rockies region.

Peak-Day Demand
The maximum daily quantity of gas used during a specified period, such as a year.

Peak Shaving
Methods to reduce the peak demand for gas or electricity. Common examples are storage and use of LNG.

Proved Reserves
The most certain of the resource base categories representing estimated quantities that analysis of geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions; generally, these gas deposits have been "booked," or accounted for as assets on the SEC financial statements of their respective companies.

Real Dollars
Dollars in a particular year that have been adjusted for inflation to make financial comparisons in different years more valid. This NPC study generally adjusts dollars to the year 1998.

Receipt Point
A point on a pipeline's system at which it receives natural gas into its system.

Refiner Acquisition Cost of Crude Oil (RACC)
The cost of crude oil to the refiner, including transportation and fees. The composite cost is the weighted average of domestic and imported crude oil costs.

Regional Transmission Organization (RTO)
Voluntary organization of transmission owners, transmission users, and other entities interested in coordinating transmission planning, expansion, and use on a regional and interregional basis.

Residential
The residential sector is defined as private household establishments which consume energy primarily for space heating, water heating, air conditioning, lightning, refrigeration, cooking, and clothes drying.

Revenue
The total amount money received by a firm from sales of its products and/or services.

Shipper
One who contracts with a pipeline for transportation of natural gas and who retains title to the gas while it is being transported by the pipeline.

SoCal
Pipeline pricing point located in southern California.

Spot Market
Commodity transactions in which the transaction commencement is near term (e.g., within 10 days) and the contract duration is relatively short (e.g., 30 days).

Storage Service
A service in which natural gas is received by the seller of the service and held for the account of the customer for redelivery at later time. Storage services are typically utilized by customers to allow more even purchases or sales of natural gas throughout the year, despite variations in end-use demand. Storage service is also a critical element of the peak period deliverability of many interstate natural gas pipelines and distributors.

Supply Hub
A geographic location where supply is available from more than one basin.

Synthetic Natural Gas
A manufactured product chemically similar in most respects to natural gas, resulting from the conversion or reforming of petroleum hydrocarbons or from coal gasification. It may easily be substituted for or interchanged with pipeline quality natural gas.

Tariff
A document filed by a regulated entity with either a federal or state commission. It lists the rates the regulated entity may charge to provide service to its customers as well as the terms and conditions that it will follow in providing that service.

Total All-Time Recovery
The sum of Total Remaining Resources plus Cumulative Production; the estimate of total natural gas that will ultimately be produced after all wells cease economic production.

Total Remaining Resources
The sum of Proved Reserves and Assessed Additional Resources; this term is often used interchangeably with "Total Resources" and refers to the total quantity of natural gas estimated to remain available for production.

Meeting the Challenges of the Nation's Growing Natural Gas Demand

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CLEAR SKIES ACT OF 2003

THURSDAY, JUNE 5, 2003

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON CLEAN AIR, CLIMATE CHANGE AND NUCLEAR SAFETY,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:35 a.m. in room 406, Senate Dirksen Building, Hon. George V. Voinovich [chairman of the subcommittee] presiding.

REVIEW OF EMISSIONS CONTROL TECHNOLOGIES AND UTILITY-SECTOR INVESTMENT ISSUES

Present: Senators Voinovich, Carper, Thomas, Cornyn, and Inhofe [ex officio].

OPENING STATEMENT OF HON. GEORGE V. VOINOVICH, U.S. SENATOR FROM THE STATE OF OHIO

Senator VOINOVICH. Good morning. The hearing will please come to order.

This is the third hearing we've had on the Clear Skies Act, S. 485 and continues a discussion that we have had in this committee for several years on the complex issues on how to clear our air by reducing emissions without doing irreparable harm to our economy and this country's competitive position in the global marketplace.

Today's hearing will focus on the issues surrounding current and projected emissions control technologies and their impact on utility sector investments. Several times throughout the course of these hearings I have stated that we need to enact a comprehensive energy policy that harmonizes the needs of our economy and our environment. We cannot forget that one of the major reasons that we have been successful economically and competitively in the world marketplace is our ability to purchase reliable, affordable energy supplies.

We must also keep in mind that we must do better in protecting the quality of our air. Despite the fact that the Clean Air Act has been extremely successful in reducing emissions of pollution, emissions of all criteria pollutant have been reduced by 29 percent since the Act was passed, despite that fact that both electricity and energy use have both increased significantly over the same period of time, the fact is, there is still significant room for improvement, and that's why this legislation has been introduced.

As we look at the issues surrounding emission control technologies and the financial stability of our utility sector, it is very

clear that the nexus between the environment and the economy is rather than an academic or political exercise, a very real issue for those who will be affected by the decisions we make on this committee and in the Senate.

The Clear Skies Act establishes legislative emission caps for SO_2, NOx, and mercury that will require utilities to reduce their emissions of these pollutants by approximately 70 percent by 2018. In order to meet these reduction requirements, utilities will need to rely on different technologies to capture each of the pollutants. The primary technology used by utilities to reduce SO_2 is the flue gas desulfurization, FGT unit, which we like to call, easier, scrubbers, which can achieve about a 95 percent reduction in SO_2 emissions.

Utilities that need to reduce NOx emissions generally install selective catalytic reduction, SR units, which can remove about 90 percent of the NOx in our power plants. In order to reduce emissions of mercury, utilities must rely on the combination of scrubbers, SCRs and other emission reduction technologies that are currently available until new mercury specific technologies are brought on line. The level of mercury removal from this method depends on a combination of control technologies used and the rank of the type of coal, bituminous, subbituminous or lignite, and composition or chlorine level of the coal.

Investor owned utilities, co-ops and municipal generators, in conjunction with the Administration and others in the public sector, are currently working on the development of several new mercury specific control technologies, including activated carbon injection, clean coal technologies and integrated coal gasification combined cycle technologies. However, demonstration projects using these technologies are in their infancy and results have varied greatly.

The technologies that utilities, co-ops and municipal generators have to install in order to meet the Clean Air requirements constitute major capital investment for these entities. I can recall when I first became Governor of Ohio that we put in place a plan that helped AEP to add scrubbers to their Gavin plant in order to reduce SO_2 emissions. Those scrubbers at that time cost over $675 million, a decade ago. I also understand that AEP has recently installed SCRs at Gavin in order to reduce NOx emissions at an additional cost of over $250 million.

Although the capital expenses that generators have had to install to date are high, the projected expenses for installing new equipment to meet new EPA regulations will be even greater. I understand that over 100,000 megawatts of coal power plant capacity will have to be retrofitted with SCRs by 2005 in order to meet the requirements of the NOx SIP call, which they're all going to make or try to make.

Additional equipment will be required to meet EPA's new standards for ozone and particulate matter which will go into effect in 2004–2005. Further, EPA is set to propose a new rule on the mercury MACT next year, that will require significant reductions in mercury emissions by 2008, despite the fact that we don't have any mercury-specific reduction technologies available to install.

It is understandable why many people feel the environmental policies that have been developed over the last decade have focused more on eliminating coal-based generation than eliminating emis-

sions. This is despite the fact that over 50 percent of our electricity generation is coal based and that we have over 250 years worth of coal available domestically. These tremendous capital expenses for installation of emissions reduction technologies have direct impact on generators' ability to provide reliable, affordable electricity to residential, industrial and manufacturing customers. Utilities, co-ops, municipal generators that rely on coal for a large percentage of their generation are facing the choice of either investing hundreds of millions of dollars on emission control technologies or fuel switching to natural gas in order to meet air quality standards.

Further, the California electricity crisis, the recent energy trading scandals, the significant increases in natural gas prices, have left utilities financially strapped and forced several major energy companies to declare bankruptcy. The end result will be inevitably higher energy prices and a drag in our economy. All sides in the debate on multi-pollutant legislation agree that the current approach to regulation utilized by EPA is plagued with burdensome, overlapping regulations that are subject to costly and time consuming litigation and have become unnecessarily costly.

In the first hearing on this topic, I stated that there are now more than a dozen separate regulations on the books for sulfur dioxide and nitrogen oxide, with additional regulations around the corner. We also discussed the fact that litigation over several of these regulations has already delayed their implementation, forestalling the air quality benefits that they were designed to achieve. The patchwork of existing and soon to be implemented regulations, coupled with the delays bred by continuous litigation, has created enormous uncertainty for utilities, co-ops and municipal generators, and has stymied efforts to improve the environment. This uncertainty has curtailed investments in technologies that would reduce emissions at existing plants, prevented numerous new facilities from coming on line and caused several utilities to consider phasing out coal based generation altogether by fuel switching.

With the implementation of the Clean Air Act provisions, other Federal environmental regulations and State clean air laws, they combine to create uncertainty for electricity generators. They have a tremendous impact on the ability of private sector utilities to raise capital and make strategic long term investment decisions, such as decisions on the purchase and installation of emission control technologies.

It's absolutely imperative that we act to pass legislation that will bring sanity to our environmental policy and prevent situations like this from taking place. Clear Skies will eliminate many of the problems that have arisen from EPA's implementation of the Clean Air Act. It will result in significant emission reductions and protect our air quality and public health. It will provide generators with a realistic and certain time table to meet emission standards. And it will ensure that they can continue to provide affordable, reliable electricity to residential, industrial and manufacturing customers and move forward with the emissions reductions.

As I mentioned at the beginning of my remarks, this is the third hearing on Clear Skies. I intend to mark up Clear Skies at the next subcommittee level as soon as possible. And I want to restate my

firm commitment to push hard to have the full committee report a bill to the floor and to have the Senate pass it this Congress.

I want to thank our first witness this morning, Chairman Kroszner, for coming to present the Administration's take on these vital issues to the subcommittee. I also look forward to the testimony of our other witnesses. I'd like to make it very, very clear that we are going to stick, I'm going to be very fastidious about the 5 minute rule, because we have a lot of witnesses today, we want to move along and I may, if we get to the third panel, even require that it be less than 5 minutes. But we'll see how things move along this morning.

I would now like to call on the ranking member of this committee, Senator Carper.

OPENING STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR FROM THE STATE OF DELAWARE

Senator CARPER. Thanks, Mr. Chairman. Good morning to our chairman of the full committee, Senator Inhofe, good morning. And to our first witness and other who will follow, glad you are here. It looks like it's standing room only here in our hearing room. That's a great thing.

Mr. Chairman, I want to start off by thanking you and your staff for working with us as we have gone through the gyrations of the last week or so trying to figure out how many witnesses we were going to have. I'm most grateful for the way that you've approached this. I think we've got a great lineup and we're looking forward to learn a lot from them and from one another as we prepare to mark up.

I especially want to welcome a couple of folks from Delaware who are here. One of our witnesses is from W.L. Gore, and they're going to be sharing with us some of the technology, exciting technology that they've developed in their testing and implementing around the country with respect to controlling emissions of mercury. Chris Koons, who works with W.L. Gore, was good enough to set up a briefing earlier this year and maybe late last year. One of the people who showed us their new technology is Rick Bucher, who's going to be sharing that with us again today. That technology apparently removes as much as 90 percent of mercury emissions from coal-fired plants. That got my attention and I think we'll be interested in hearing what they have to say.

I'm told that Chris Koons going to play the role of Vanna White in working with the visual aids. That will be an interesting role for her. Thank you both for coming.

And it's these kinds of technologies that I think move us and help move our country and the Congress toward a cleaner environment, which we all want to support.

I'm also looking forward to the third panel, when we'll have the opportunity to hear maybe for the first time before a Senate committee an aspect of this debate that we've not previously considered, and that is the view of this issue, particularly the issue of global warming, for investors, investors who invest in the utility industry.

One week ago today in the *New York Times* there was an article in the business section that I'd like to quote from briefly, and then

Mr. Chairman, I'm going to ask consent that the full article be entered into the record. It was written by a woman whose name is Catherine Seely, I hope I've got that right, if she's listening or watching. But she said this, she said, "Almost a quarter of the shareholders of the Southern Company, one of the Nation's largest utilities, voted at an annual meeting today to require the company to analyze and report on the potential financial risks associated with its emissions of the pollutants that cause global warming."

The article goes on to say that last year similar resolutions concerning global warming garnered an average support of 18 percent, while this year the average has grown to more than 25 percent. More and more companies are beginning to face such questions about their environmental record for investors while here in Congress we continue to discuss new legislative strategies to clean up our air. On Wall Street, there is a growing call for companies to recognize that emissions, including CO_2 and those that lead to global warming, should be addressed. An increasing number of shareholders who vote with their dollars are beginning to invest their capital based on how companies are addressing these issues. And those shareholders and the companies are looking to us for a signal on what will come.

While today's hearing focuses on the Clear Skies Act, I want to remind the committee that along with Senators Chafee and Gregg, I've introduced a Clean Air Planning Act, which represents what we think is a sensible solution to this problem. The bill would provide a market based and flexible approach to regulating CO_2, NOx, mercury and SO_2 emissions, while continuing to provide affordable and reliable electricity.

And I'd be remiss if I didn't take just a moment, Mr. Chairman, to say something about our good friend Christy Whitman, I always address her as Governor Whitman when she comes before this panel, who since her last hearing announced her plans to step down as the Director of EPA. I will miss her personally, and I certainly wish her and her family the very best in all that lies ahead, and I wish President Bush, another old Governor, some good luck in nominating a replacement who is as capable and as cooperative as Governor Whitman has been on many issues that we've dealt with her together. She's been a strong advocate for moving a multi-pollutant bill through this committee and through the Senate, and I hope we can meet that challenge even after she's gone.

I also hope that before she leaves, she'll be able to respond to the requests that Senators Chafee and Gregg and I made to her this past April, when we asked for an analysis of the Clean Air Planning Act. And to date, we've not received it. Having that information we think is critical to our ability and this committee's to evaluate alternative options and to develop effective legislation.

Mr. Chairman, let me conclude with this. Something I said at our first hearing on this topic, I just want to repeat it, I said it I think when Governor Whitman was before us, and here it is. We should agree on at least a set of principles to guide us as we move forward, and I again offer the following four principles.

No. 1, and four is better than three, a comprehensive four mission strategy that includes carbon reductions will provide regulatory certainty and offer the greatest environmental and economic

benefits. No. 2, markets work. Cap-and-trade-based emissions standards provide the maximum incentive to achieve cleaner power.

No. 3, stairs are better than cliffs. Prompt but gradual reductions through multi-phase or declining caps are more desirable than single phase cuts. And last but not least, No. 4, eliminate redundancy only when emission reductions are secured. Existing regulatory programs such as new source review will need some modernization in light of tight emission caps.

Well, that's it. I look forward to the hearing. It's going to be a good one, and Mr. Chairman and all our witnesses, thank you all for making it possible.

Senator VOINOVICH. Thanks very much, Senator Carper.

I'd like to call on the chairman of our committee, Jim Inhofe.

OPENING STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE STATE OF OKLAHOMA

Senator INHOFE. Thank you, Mr. Chairman. I would also say favorable things about Governor Whitman, particularly since she recanted the very statement that you read at a later date. It takes a very large person to do something like that.

I want to thank Dr. Kroszner for testifying on this current state of the knowledge regarding emissions control technology. As you know, this topic is of great significance to not just the four of us at this table, but our committee. While I would have preferred that this data had come to us earlier, I appreciate the Administration is here today to ensure that this subcommittee has the most up to date information as it considers the legislation.

I want to reiterate something the chairman said that I'm committed to the Clear Skies goal of reducing the SOx and NOx and mercury emissions by 70 percent, which is the most aggressive Presidential initiative in the United States history to reduce power plant emissions. That's worth repeating, because you don't hear this very often out in the media. This is the most aggressive Presidential initiative in the history of reducing power plant emissions.

But I am concerned that the phase one mercury interim cap is too stringent and creates too much uncertainty. U.S. utilities contribute only 1 percent of the mercury emitted globally and new scientific findings have called into question the health effects associated with mercury emissions. While I intend to address the question of the current state of science regarding mercury at a future full committee hearing, the focus of this hearing is on the control equipment.

The decisions we make should be based on the best available facts about how well the technologies work because regulation of mercury is very, very costly. These costs are passed on to consumers as higher electric prices. And high prices are like a regressive tax on the poor in our Nation. That's something that everybody has to have. And it's one that hits the poor harder than it does the wealthy.

I'm aware that the Administration has expended much effort to incorporate into its models the most accurate assessments of what the various technologies accomplish in terms of reducing SOx and NOx and mercury. While reducing emissions levels can be ex-

tremely expensive, much is understood about the capture of SOx and NOx in particulate matter. There is little uncertainty regarding the costs and emissions capture rates in SOx in the latest technologies such as scrubbers and bag housing.

Mercury stands in sharp contrast. While there are technologies under development, and we'll hear of some of them toady, as Senator Carper pointed out, there is no commercially proven and available technology to remove mercury from coal-fire emissions. My main interest in this hearing is the estimated mercury phase one co-benefits level. I feel compelled to note my longstanding frustration at the ever-evolving definition of co-benefits as this process has progressed. So I want to make clear at this hearing how I define it.

Mercury co-benefits are the levels of mercury expected to be achieved as a result of meeting SOx and NOx phase one emissions limitations. Dr. Kroszner, when it becomes question and answer time, I'll be asking for your definition to see if you're in agreement with that.

Clearly, the state of knowledge regarding mercury capture is rapidly evolving. It is still in its infancy. Much uncertainty remains about the levels of capture that are achieved using proven technologies. Dr. Kroszner, you written statement reflects both these statements. While Clear Skies has a hard cap of 26 tons, your models predict that the co-benefits will result in emission levels in the range of 34 to 46 tons. This range also demonstrates the level of uncertainty that exists even now about the levels of control and what the various technologies will achieve.

My primary interest is to better understand the major assumptions your models make about various combinations of equipment. Specifically, how have the models evolved from the 2002 to 2003 for both EPA and EIA and also what equipment combinations drive the differences between the co-benefit results projections.

I would like to compliment the Administration for the level of attention given to continually upgrade its estimates by working with researchers and industry to improve the assumptions it uses in the models. This new information is profound in its implications. I am also encouraged the Administration is continuing in its efforts to reconcile the differences between the EPA and the EIA models so that Congress has the latest information as to the science, as the science matures.

So Mr. Chairman and Mr. Ranking Member, I'm delighted to have all three panels. And I do agree with your restriction on time. Otherwise, it's going to last the whole day.

Senator VOINOVICH. Thank you, Mr. Chairman.

Senator THOMAS.

OPENING STATEMENT OF HON. CRAIG THOMAS, U.S. SENATOR FROM THE STATE OF WYOMING

Senator THOMAS. Thank you, Mr. Chairman. I agree with your restriction on time also, so I'll be very brief.

I agree with what the chairman has just said, but I certainly welcome this hearing. We all agree we want clean air and we want to move in that direction, of course. So we need to talk about it.

Since the enactment of the Clean Air Act, there have been significant reductions in NOx and SO_2 and technologies exist for both of these emissions. My concern is the lack of commercially demonstrated technology for mercury, particularly for western coal, and general belief that mercury can be captured by adding scrubbers in the routine way of doing it. This may work for eastern bituminous coal, it does not work in the west.

So I agree very much with what the chairman has said, and I look forward to it, and I appreciate your being here and hope we can come up with a reasonable approach to continue to get clean air. Thank you.

Senator VOINOVICH. Thank you, Senator Thomas.

Dr. Kroszner, you can proceed with your testimony. We're very happy that you're here today.

STATEMENT OF RANDALL S. KROSZNER, MEMBER, COUNCIL OF ECONOMIC ADVISERS

Dr. KROSZNER. Thank you very much, Mr. Chairman, ranking member and members of the committee. I'm delighted to be able to address you today on this extremely important issue of the Clear Skies Act of 2003.

I will just give you a few highlights of the testimony to try to keep in the 5 minute limit, and if I may just submit for the record the formal written testimony that I have.

Senator VOINOVICH. Without objection. And Senator Carper, without objection, we'll include that which you referenced in are opening statement earlier.

Senator CARPER. Thanks, Mr. Chairman.

Dr. KROSZNER. Thank you very much.

Strict enforcement of environmental rules can be dated back as early as 1306, when a man was allegedly executed for burning coal in London. In the United States, concern for air quality dates back to the mid–19th century, when many municipalities began to issue smoke ordinances. Responsibility for regulating air polluters rested almost exclusively with States and localities until the 1970's.

During these years, the Federal Government began to take a more active role in environmental regulation with the passage of the National Environmental Policy Act, Clean Air Act, and further amendments later in the 1970's. One common thread over time has been that the U.S. air quality regulatory policy, and indeed, environmental regulation in general, has typically relied on command and control regulation. This type of regulation mandates technologies or processes, does not take advantage of the power of markets, and is therefore by its very nature more expensive and less efficient than is necessary.

In contrast, the President has crafted an initiative that will clean our air using a proven market based method. Announced in February of 2002, the Clear Skies Act would be the most significant and aggressive step America has ever taken to cut power plant emissions of three harmful pollutants: sulfur dioxide, nitrous oxide and mercury. The proposal, which builds upon the highly successful 1990 acid rain trading program, will cut emissions by approximately 70 percent over the next 16 years.

Clear Skies employs a dynamic approach to regulation that mandates specific emission-reduction emission caps, while providing managers with flexibility to reduce emissions in the most efficient and least costly manner possible. Through a market-based cap-and-trade program, Federal emission limits, or caps, are set and emissions permits are distributed to electricity generators. Managers then have the advantage to determine the most efficient means of action; whether it is sale or purchase of unused allowances, or banking of credits for later use, Clear Skies provides regulatory certainty and lays out the timeframes necessary for managers to design a cost-effective strategy tailored to both current budget and future plans.

With this structure, we uphold the principal feature of the President's initiative, improving air quality more cost-effectively, so Americans can continue to rely on clean and affordable electricity. Clear Skies will achieve faster reductions than in the current Clean Air Act by creating incentives for over-compliance and innovation—the means to reduce pollution by more than or earlier than required—and then those who do so, can generate and sell extra credits.

The Clear Skies Act will improve health, visibility and a diverse range of ecosystems by reducing the emissions of NOx, SOx and mercury. In short, Clear Skies will result in dramatic progress toward solving our Nation's persistent air quality problems.

As you are well aware, the crucial element of any regulatory policy is not only recognition of the benefits received from emissions reductions, but also the resource costs associated with the policy. Those costs, it must be emphasized, are ultimately borne by the citizens, whether by stockholders or companies making the reductions, or by consumers of electricity, or both. Therefore, the Administration takes the economic modeling of Clear Skies quite seriously. In this respect, over the past year we have gained better understanding of the costs to abate NOx and SOx and the co-benefits associated with reduction of mercury.

Understanding the removal costs associated with mercury is still in a bit of an early stage, exactly as the Senators had been describing. The goal of Clear Skies is to reduce mercury emissions by 70 percent by 2018, with an interim cap of approximately a 50 percent reduction by 2010. Mercury emissions will be reduced from current levels of approximately 48 tons to 15 tons in 2018, with an interim cap of 26 tons in 2010.

Clear Skies is designed to meet the goal of reducing the mercury with a trading program that is more cost-effective than the program currently required by the Clean Air Act. The interrelationship of the cap levels for NOx, SOx and mercury is also a very important feature of the Clear Skies program to provide much more flexibility, greater regulatory certainty and help in planning cycles with the co-benefit of mercury reductions from the NOx and SOx emissions controls.

So in looking at the total resource costs, and looking at the cost of mercury removal, I want to talk more during the question period about some of the new data that has been gathered throughout the EPA's information collection request and various pilot programs. What we've been finding is that even though there are uncertain-

ties, I just want to highlight a couple of the empirical estimates of interest. The first phase of the mercury-reduction cap is designed to take advantage of the interrelationship of NOx, SOx and mercury emissions and do this through SCRs, scrubbers, NOx and SOx controls determining co-benefits.

Our updated analysis suggests that the NOx and SOx limits in Clear Skies would lead to estimates of annual mercury emissions in 2010 of controls between 34 and 46 tons. What I can do is provide you with more details during the question period. But just to sum up, the President's Clear Skies legislation calls for a 76 percent reduction in power emissions during the next decade and a half. The legislation will meet the required health based standards laid out in the Clear Air Act. It will achieve those results sooner than required at a much lower cost to consumers.

We look forward to working with the committee and Congress to create a market based system that will provide early reductions and affordable energy prices for consumers. Thank you, Mr. Chairman and I look forward to answering your questions.

Senator VOINOVICH. Thank you, Dr. Kroszner.

I'll start the questioning off. You stated that Clear Skies will achieve faster reductions than the current Clean Air Act. Can you explain in greater detail how these provisions will work and how quickly you believe emissions will be reduced?

Dr. KROSZNER. What we've done is we have a market-based system that gives incentives for early reduction. Unlike the uncertainty associated with the so-called MACT that will be coming down the line, we have a very clear structure of how there will be reductions that need to be occurring by 2010 and then by 2018. A clear system of SOx that will give incentives for people to start innovating today and reducing today rather than spending a lot of time litigating hoping that there can be changes in the MACT.

So I think the market based structure that we have gives the incentives for earlier reductions than we otherwise would get through the current structures.

Senator VOINOVICH. In other words, because of the certainty of the provisions of Clear Skies, it will lay out a pattern for the future which will make it much easier for people to move forward because they'll know what's expected of them rather than what we currently have on the books.

Dr. KROSZNER. Precisely. There's a great deal of uncertainty associated with the mercury MACT, and there's likely to be a lot of litigation associated with that, which of course engenders a great deal of uncertainty. Something like Clear Skies, which very clearly sets out with legislative mandates a very clear time table, provides much more certainty for firms to do this, as well as the cap-and-trade program that also gives the incentive for early innovations and early reductions.

Senator VOINOVICH. Several of the witnesses we're going to hear today will argue that we need to put a cap on carbon dioxide emissions in order to improve the financial health of investors. However, the political reality we face in Congress is the regulation of carbon will not become law for at least some time. That's the lay of the land here.

Would you like to comment on that?

Dr. KROSZNER. I think it's extremely important to go ahead with the Clear Skies legislation. The President is very much committed to improving the health of American citizens through exactly this kind of means, and improving visibility at our national parks and throughout the country. And moving quickly and moving today on this legislation is something that is very important. We should not delay for other reasons, we should go on this. We get much earlier health benefits by moving promptly on exactly this.

Senator VOINOVICH. There are many of us that realize that there is very much concern about carbon.

Dr. KROSZNER. Yes.

Senator VOINOVICH. We've been working very conscientiously to try and find some kind of a compromise that does not cap carbon but would encourage technology and also the sequestration of carbon, which is a major problem that we have, the lack of it is a major problem today. Has the Administration given any consideration to some compromise in this area?

Dr. KROSZNER. I think the Administration's proposal so far with the registry system, with the reduction system that we have in place, the commitment to reduce intensity by 18 percent over time, goes precisely in that direction of trying to deal with these issues in a way that is as market based as possible. But of course, we look forward to working with Congress as we develop and get more information about the costs and benefits of carbon and of carbon reduction. The issues are still really in a very, very early stage. So I think we need to gather more data.

But obviously as we gather more data, and do more analysis, we very much look forward to working with you to see what should be done. But I believe that the proposals and the program that we have today, with the 18 percent reduction in intensity over time, is an excellent way to deal with the problems, at least on the science that we have today.

Senator VOINOVICH. Thank you.

Senator CARPER.

Senator CARPER. Thanks, Mr. Chairman, and Dr. Kroszner, thank you for being with us today and for your testimony.

I found your written testimony informative and are verbal testimony as well. However, I think it's remarkable in that your testimony does not ever mention the issue of carbon dioxide or greenhouse gases or climate change or global warming. And I'm just wondering, has the Council of Economic Advisers conducted an analysis of the impact for the Clear Skies Act on, or really any other multi-pollutant bill, and what impact those legislation, those pieces of legislation will have on CO_2 emissions from the power sector? Do you think this is an issue that we should consider?

Dr. KROSZNER. We have not undertaken any specific analysis of that issue. We've been looking primarily at the three main pollutants of NOx, SOx and mercury. So we've been looking at the interaction among those primarily.

That is not to say that carbon isn't a very important issue. As I'd mentioned, the President has his plan for the 18 percent reduction in intensity of carbon emissions.

Senator CARPER. Eighteen percent reduction, could you put that in context? Is it 18 percent reduction below what it is right now to what it would otherwise be at some date in the future?

Dr. KROSZNER. It's 18 percent reduction in the intensity. So that is the amount of emissions relative to GDP. So it's a ratio.

Senator CARPER. Below the intensity this year? Five years from now, 10 years from now? Is it an 18 percent reduction below current levels?

Dr. KROSZNER. It is an 18 percent reduction over time from current levels. That is my understanding of the program.

Senator CARPER. We'll come back and verify that. In fact, let me just ask you to verify that for the record.

Dr. KROSZNER. Certainly.

Senator CARPER. My understanding is it's an 18 percent reduction, not below current levels, but below what they would otherwise be at some date in the future. And maybe we can verify that.

Dr. KROSZNER. Certainly we'll do that for you, Senator.

Senator CARPER. In your testimony, why don't you address CO_2? I think it's just peculiar, it's an issue that is deemed to be important by a lot of people, and you never mention it.

Dr. KROSZNER. It certainly is an important issue. I don't mean to not mention it, or by not mentioning it say that it is not an important issue that we continue to look into and continue to spend an enormous amount of resources studying, much more than any other country. But I did not realize that this testimony was to be focusing in that. I thought it was to be focusing on the Clear Skies Act itself. That's why I tried to limit myself to focus on the three main pollutants in Clear Skies.

Senator CARPER. You stated very directly in your testimony that Clear Skies is designed to meet the Clean Air goal of reducing mercury with a trading program that I believe you say is more cost-effective than the program currently required bay the Clean Air Act. Here's my question. What is the cost that you're using of the current Act's requirement for comparison purposes? And second, what is the cost of the Clear Skies mercury program?

Dr. KROSZNER. The cost of the Clear Skies mercury program, let me talk just a little bit generally about how we get to those costs. What we're doing is looking at the NOx and SOx reductions from scrubbers, SCRs, et cetera, using various forms of technology. And we do get some co-benefits with a reduction in the level of mercury that gets into the sky, simply by taking out the NOx and the SOx. And that then gives us estimates of how much would be taken out just by the mere fact of controlling NOx and SOx based on 2010 and 2018 goals that we have in mind.

Then what we do is say, let's try to see what will the costs be of moving beyond the co-benefits if we need to move beyond the co-benefits. And currently both the EPA and EIA estimates are that the costs to meet the interim goal, 2010, would be on the order of $650 million to $700 million per year. Both modeling techniques suggest that that's approximately what the cost would be to achieve our interim goal of 26 tons.

Senator CARPER. I got lost there in the weeds. I asked two questions. Just come back and answer them as directly as you can. First, what is the cost that you're using of the current Act's re-

quirements for comparison purposes? Because what you're asserting in your testimony is that the trading program within the Clear Skies initiative is more cost-effective than the current Act. What is the cost you're using for the basis of your comparison? I think you may have just given me the cost of the Clear Skies mercury program. But let me just have both of those again, please.

Dr. KROSZNER. Sure. The mercury MACT program, the implementation of it, is highly uncertain. So we don't have a specific number for the MACT implementation, though we very, very strongly believe, and I think it's from past experience with other attempts to use something like MACT, is that relative to a SOx system, it's going to be much more costly to do plant by plant types of controls, use the MACT structure, which looks not at cost reduction, but looks at just particular technology use.

So by taking that approach rather than an approach that allows for SOx, allows for companies to try to choose the most cost efficient means of reducing things, we know that that will be more expensive relative to an alternative. But I don't have a specific number to give you that.

Senator CARPER. If I could just ask you to attempt to respond in writing for the record on the two questions. If you could do that, that would be much appreciated.

Dr. KROSZNER. Sure.

Senator CARPER. Thank you. I see my time's expired. Thanks, Mr. Chairman.

Senator VOINOVICH. Chairman?

Senator INHOFE. Thank you, Mr. Chairman. Let me read a couple excerpts from a letter, since Senator Carper has made some requests of the Administration insofar as CO_2 is concerned. This is a letter which I will want to insert in the record at this time, but will read just a couple sentences. This is from Christine Todd Whitman to both Senator Voinovich and myself.

"I noted with particular interest the comments by several witnesses that we not hold hostage Clear Skies certain and aggressive reductions of sulfur dioxide, nitrogen oxide and mercury emissions to a debate on whether carbon dioxide should be regulated. The Administration shares these views. As the President stated in his March 13th, 2001 letter to several of your colleagues, 'I do not believe that the Government should impose on power plants mandatory emissions reductions for carbon dioxide, which is not a pollutant under the Clear Air Act.' "

[The referenced letter follows:]

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

APR 25 2003

THE ADMINISTRATOR

The Honorable James Inhofe
Chairman, Committee on Environment
and Public Works
United States Senate
Washington, DC 20510

The Honorable George Voinovich
Chairman, Subcommittee on Clean Air,
Wetlands and Climate Change
Committee on Environment and Public
Works
United States Senate
Washington, DC 20510

Dear Mssrs. Chairmen:

I would like to thank you for your sponsorship of the President's Clear Skies legislation and your efforts to advance it in the Senate. Your recent subcommittee hearing was the first Congressional hearing this session on our groundbreaking efforts to further reduce air pollution from power plants.

The hearing outlined many issues that will be debated and discussed as we move through the legislative process to passage. I noted with particular interest the comments by several witnesses that we not hold hostage Clear Skies' certain and aggressive reductions of sulfur dioxide, nitrogen oxides, and mercury emissions to a debate on whether carbon dioxide should be regulated.

The Administration shares these views. As the President stated in his March 13, 2001 letter to several of your colleagues: "I do not believe...that the government should impose on power plants mandatory emissions reductions for carbon dioxide, which is not a "pollutant" under the Clean Air Act." And as I and other witnesses stated clearly, the time to act on Clear Skies is now.

Among other reasons why CO2 should not be included in the Clear Skies Act is that pursuing sharp reductions in carbon dioxide from the electricity-generating sector alone could cause dramatic fuel shifts, thus running the risk of endangering national energy security and increasing energy costs to consumers. It would be a shame to lose the significant near-term

public health and environmental benefits that will come from reducing these three pollutants. The challenges associated with potential long-term global climate change warrant an entirely different approach, including a concentrated focus on developing and deploying advanced energy and sequestration technologies, both in the United States and throughout the world, as we improve our understanding of global climate science. In the near term, the President's goal is to slow down the rate of growth in emissions of greenhouse gases through voluntary measures, including EPA's highly successful energy efficiency, methane, and Climate Leaders programs.

Early in this Administration, the President convened a cabinet-level process to advance our research on global climate science and energy technologies, and to develop mitigation initiatives. Last week, the White House provided you a fact sheet enumerating the many actions being taken by the Administration to implement the President's strategy. These actions represent a comprehensive range of domestic and international initiatives that tap the power of markets, realize the promise of technology and ensure the widest-possible global participation, while encouraging sustained economic growth.

Again, thank you for your leadership and efforts on Clear Skies. I look forward to continuing to work with you to pass this legislation. If you have further questions, please contact me or your staff may contact Diann Frantz in the Office of Congressional and Intergovernmental Relations at (202) 564-3668.

Sincerely yours,

Christine Todd Whitman

cc: Senator James Jeffords
Senator Thomas Carper

Senator INHOFE. A lot of us have looked at this over a period of time and tried to sort out the emotions from the science in terms of greenhouse gases, CO_2, global warming, and go back and looking at it historically when we can recall during that 500 year period ending in 1300 which was considered to be the medieval warming period, going into the little ice age, then going back into a warming period. The interesting thing being that that second warming period ended in 1940. So we went into a cooling phase. And what happened in 1940? It was the expanded use of automobiles, CO_2 emissions and all that. Totally contradicts the assumptions that many people have, their belief certainty of this whole global warming concept.

So my request is, and I'm asking this on the record in this meeting, that if you do go back and do, as Senator Carper is asking you to do, evaluate and look at CO_2, that you take into consideration the fairly new Harvard study of the 1,000 climate change period. It involved 240 scholars and came up and pretty much opened this up and gave new concepts to this whole discussion.

All I want, and I said this on the first day I became chairman of this committee, is that we're going to look at sound science. We're going to adhere to that. So I'm going to ask you to take that into consideration in anything that you're doing.

Now, I mentioned to you in my opening statement that my definition on the, by the term co-benefits in the context of the mercury provisions, I'd like to have you give us your definition or the Administration's definition.

Dr. KROSZNER. I think we're very much consistent with the definition that you had given. The co-benefits are the benefits of mercury reduction that come along with trying to reduce the emissions of NOx and SOx. So those are the ones that by trying to meet particular caps on NOx and SOx, you also get in terms of mercury reduction.

Senator INHOFE. That's excellent. I agree with that.

What are the main drivers that are responsible for the co-benefits level of 34 tons for EPA and 46 for EIA?

Dr. KROSZNER. They have slightly different modeling approaches. Let me highlight a few of the differences. We've been spending the last 6 months really trying to dig deep into these models and I really want to very much commend EPA and EIA for working so closely together. We've really been running them ragged and I really want to praise them for the great progress that they have made in helping us.

Senator INHOFE. And as you do this, if you'd use as layman terms as possible.

Dr. KROSZNER. I will try to, since I'm very much a layman also in many of these areas. One has to do with the amount of mercury removal, getting at this notion of how much mercury comes out when you apply these different types of technologies. And there seems to be a fair amount of agreement on the two sides for bituminous coal. There seems to be enough data and similarity of modeling techniques that we'll get roughly 90 percent reduction from the technologies that we have some information on.

For other types of coal, we don't have quite as much data and there's a little bit more difference between the two sides on that. So that's one of the areas I wanted to highlight, is differences in the two approaches. They make somewhat different assumptions about natural gas prices. They make somewhat different assumptions about growth in the demand for electricity over the next 20 years. And also a little bit of differences in the way that they think about the coal models. That is the choice of different types of coal to be used. And I think there are some differences in the way they think about how flexible contracts are and such.

So I'd highlight those as probably the three or four major areas of differences between the two that have led to what I would think of as sort of a sensitivity analysis that now gives us a range of 34 to 46.

Senator INHOFE. And it's my understanding that those entities are meeting and talking about these differences and the outcomes, the results that they're coming up with?

Dr. KROSZNER. Yes. We've had a lot of convergence, and have a much, much better understanding for the differences in the two models; and EPA and EIA continue to work together. And again, I have to praise them for the gauntlet we've kind of put them through. I don't think they've ever been asked to work so closely together before. And I think both sides have benefited quite a bit. This is really how science improves.

Senator INHOFE. Thank you very much, Dr. Kroszner.

Senator VOINOVICH. Senator Thomas?

Senator THOMAS. Thank you. I guess I need to pursue that a little further. What is the latest estimate that you have then of the co-benefits for mercury?

Dr. KROSZNER. Roughly, from the EPA models, we have on the order, I'm sorry, for co-benefits——

Senator THOMAS. Reduction in phase one.

Dr. KROSZNER. The estimates coming out of the models are that by meeting the SOx and NOx caps by 2010, we would have between 46 and 34 tons of mercury still being put into the air. That's where we are in terms of the two modeling approaches.

Senator THOMAS. Your original one was what level?

Dr. KROSZNER. The original focus, or the original one using less data that we have was one based on EPA in the upper 20's.

Senator THOMAS. Twenty-six, I believe, wasn't it?

Dr. KROSZNER. Yes, the cap is set there. I certainly want to emphasize, and this is not a model to minimize what EPA and EIA have done, there's always some uncertainty. These are really estimates that come out of the models. That's true whether it's trying to estimate co-benefits in mercury or trying to estimate what economic growth will be in 2010, which is another exercise that I do at the Council of Economic Advisers.

So that's why I say, these numbers are estimates, so upper 20's is roughly where we were, and now we're in the range of sort of upper 30's, I would say, upper 30's to low 40's, as the reasonable range for where we are.

Senator THOMAS. So that in terms of what the expectation will be, then, in the regulation, will be where?

Dr. KROSZNER. The President's proposal has a 26 ton cap in 2010. What we wanted to do, the request from the committee was to try to provide updated information, and we've gathered new information from last year, and we're eager to share that with you. So we wanted to present that to you. But the President's proposal is a cap of 26 tons in 2010.

Senator THOMAS. I guess I don't understand that. If your information and data shows one thing, and your President's program shows another, how do you reconcile those two things?

Dr. KROSZNER. Obviously we have put forward a program based on the best science that we had available at the time, as the proposal was put forward in February of 2002. And we wanted to provide you with updates on where the science is.

Senator THOMAS. So you'll be supporting an update based on the newest data?

Dr. KROSZNER. We support the President's proposal. We think it's a very good proposal, of course.

Senator THOMAS. I don't understand that. Tell me what you're talking about.

Dr. KROSZNER. But we wanted to provide you with the new information. Obviously——

Senator THOMAS. You want us to change it, then, is that it?

Dr. KROSZNER. Occasionally Congress does change things that the President puts forward. I know that that does happen.

Senator THOMAS. That does happen, yes.

Dr. KROSZNER. As shocking as it has been to me in my 2 years in Washington. So of course, we understand that that could be a possibility. But the President's proposal certainly is with the 26 ton cap in 2010, but obviously we wanted to provide you with the updated information.

Senator THOMAS. Thank you.

Senator VOINOVICH. Dr. Kroszner, when the mercury number came to our attention, that the Administration suggested in the Clear Skies proposal, many of us were skeptical of that number. What you're saying here today is that after working between EPA and with the Department of Energy that that number of 26 does not reflect the most recent information that you've been able to derive in terms of co-benefits, and that is that rather than the 26 ton number that the number should be somewhere between 34 and 46?

Dr. KROSZNER. If you are choosing the number based on the estimates of the co-benefits. First, of course, as I had said in response to Senator Thomas, there is uncertainty around these estimates. So I don't want to say that these are necessarily the true numbers that we know with certainty. We don't know them with certainty.

But also, there could be other factors.

Senator VOINOVICH. Is 34 better than 26, based on your information or not?

Dr. KROSZNER. We have more data, so we have more data than we had from before, and I think we've improved our modeling techniques over time. But there may well be more considerations that come in to making these calls. Because the science brings us so far, but there's certainly some uncertainty that is still left over. There still may be room for policy judgments that come in.

So I think that it is important to take co-benefits in as one very important factor. But it is, I think, one very important factor in that it is a policy judgment as to whether one wishes to take more factors into account or not. And that's why we wanted to make sure to provide you with the information on co-benefits. But of course, other factors can come in to make the decision on where it's appropriate to put a particular cap.

Senator VOINOVICH. Have you done any investigation into in the event that you had the 26 number in this, whether that would cause utilities to fuel switch to natural gas?

Dr. KROSZNER. We've looked into that. Fortunately, the flexibility of the Clear Skies policy allows people not to have to fuel switch. Projections from both models suggests that there would be relatively little fuel switching between coal and natural gas over time. It's precisely because of the flexibility that Clear Skies allows. So this is not something that should be seen as putting to death one

type of fuel. It's something that I think is very valuable in maintaining fuel diversity, which is an important part of our fuel security program.

Senator VOINOVICH. You haven't really looked at that number, then?

Dr. KROSZNER. We have modeled, the models predict whether there will be a lot or a little fuel switching. And there will be relatively little fuel switching under both models.

Senator VOINOVICH. You're saying that the 26 number would not cause fuel switching?

Dr. KROSZNER. There would be a small amount of fuel switching but not very much. What people will do is, given the model's assumption about electricity demand, about the prices of natural gas, is that people may choose to pay more for the permits, the permit prices would go up. But that might be a more effective means of trying to generate electricity than switching to gas. So, that flexibility allows——

Senator VOINOVICH. So what you're saying is that part of the decisionmaking has to do with the price of natural gas?

Dr. KROSZNER. The price of natural gas and the price of the permits. So the models both predict what those will be over time. Look at the choices that the managers would make between choosing to continue to use coal and choosing to switch to natural gas. The model suggests that there would be relatively little switch between coal and natural gas.

Senator VOINOVICH. Senator Carper?

Senator CARPER. Thanks, Mr. Chairman.

Several of us on this panel, there aren't a whole lot of us here, but several of us here on this panel are very much interested in working on an issue that we're not discussing today, but it's an issue that will be before the Senate, and I hope fairly soon, and the issue is asbestos. There are, as you know, in this country a lot of people who have been exposed to asbestos over the years. Many of them have become sick and have died. They're not getting the kind of financial help that they need. In the meanwhile, a fair amount of money is being siphoned off to help people who are not sick and will never be sick from asbestos exposure.

And we're working, Senator Voinovich and I and others are working with Senator Hatch. I think Senator Thomas has an interest in this issue as well. We're trying to come up with an approach to create a trust fund where companies, manufacturing companies and others, insurance companies, would contribute money into a trust fund from which would be paid claims to folks who meet certain medical criteria from their exposure to asbestos over the years.

One of the reasons why companies are interested and insurance companies are interested in contributing to a fund, creating a trust fund, and contributing a lot of money to it, and Senator Hatch was talking yesterday about, I think about a $108 billion trust fund that would be created for this purpose. One of the reasons why companies are interested in doing this is because it provides some certainty for them in an uncertain world. One of the lessons that I learned, and I'm sure Governor Voinovich learned this long before I did, being one of the Governors of our States, in promoting economic development and job creation, companies like certainty. And

to the extent that we can provide that, we ought to. We try to provide a nurturing environment for job creation and business development in my State, as Governor Voinovich did in Ohio.

Which leads me to this question, there are a number of utilities, one of whom will testify later today, who will talk about the value of certainty in their industry, the idea of knowing what they're up against in terms of caps on sulfur dioxide, nitrogen dioxide, mercury and SO_2. In your verbal testimony, I don't recall hearing anything about the economic value of certainty. It may be there in your written materials and I missed it.

But companies have raised with me and I suspect others on the panel the need for certainty. And I'd just like to hear from you how you would include that in an economic model. How would that be valued?

Dr. KROSZNER. Certainly it's something that economists often talk about as a risk premium when there is greater uncertainty, greater risk associated with taking one path versus taking another. And so of course there has to be some compensation for the greater risk or greater uncertainty. Typically for, let's say, a riskier firm, if they were to issue bonds, they would have higher interest rates associated with them. If there's greater uncertainty for the firm itself, there is more difficulty in their planning processes, it's more difficult for them to think about what they need to do going forward.

So it makes their planning cycle more difficult, it can make their planning cycles more difficult for firms to figure out where they need to be investing in different areas. So it can raise the cost of capital in general if there is greater uncertainty, and it can also just make it more difficult for firms to move forward to invest, because they're just not sure where they should be going.

Senator CARPER. Thank you for that response. How would you include that in an economic model, in the work that you do?

Dr. KROSZNER. What it would be is in terms of an economic model going forward, let's say, with the challenges that the economy may be facing now, we may be seeing less investment than we otherwise would be, because of uncertainties about the economic future. So one way in which we take it into account is that it would reduce overall investment in the economy if there are broad uncertainties. If there's much more certainty about the direction of the economy, let's say it's a good direction for the economy, then of course, managers will be able to make plans more easily, they're more likely to go forward and increase capital spending plans. So that would be one way in which I would take uncertainty into account in an economic model.

Senator CARPER. If you want to give it some further thought later and want to respond further in writing, that would be welcome. Thank you.

I think I have time for one more. What price signal does the President's voluntary emissions intensity approach, and that's where we're talking about the 18 percent, and that's 18 percent below a baseline. There's an increase in the emissions. And when you're talking about 18 percent reduction, it is an 18 percent reduction below the baseline, or projected increase. But what price signal

does the President's voluntary emissions intensity approach send to the markets and to industry about reducing greenhouse gases?

Dr. KROSZNER. What it does is it, I believe, provides some, the combination of Clear Skies and our carbon plan does provide some certainty for going forward and provides an incentive for the companies to reduce their emissions. We don't have a specific price signal that is out there now, but implicitly there will be one that will be developing, the choices people make to try to reduce to meet this 18 percent intensity reduction. But there's not a specific number that is out there now. But there is an incentive that is there.

Senator CARPER. Thanks very much.

Senator VOINOVICH. Mr. Chairman.

Senator INHOFE. I have only one question. You say that there will be no fuel switching. Is this true for both the EPA and the EIA models, or just the EPA?

Dr. KROSZNER. I believe it's for both models that they would have relatively little fuel switching associated with the President's proposal.

Senator INHOFE. Thank you. No further questions.

Senator VOINOVICH. Senator Cornyn, do you have any questions?

Senator CORNYN. Not of this witness. Thank you.

Senator VOINOVICH. Thank you.

Dr. Kroszner, we'll be submitting some other questions to you in writing and we'd like you to get back. Senator Carper is concerned about some of the responses that you have given. All I can say to you is, and to the other people who are coming here, when I talk with utility executives, and I have been authorized by one of them to say publicly, American Electric Power, which is a very large producer of electricity, that they will never build another coal-fired facility, and they will switch to natural gas unless this situation is clarified for them. They are very supportive of the President's Clear Skies proposal.

Thank you very much. We'll have our next panel.

Dr. KROSZNER. Thank you very much.

Senator VOINOVICH. While the panel is coming forward, I'm going to introduce them and give you a little background on them. Our first witness is Dr. Larry Monroe. He's the Program Manager of Pollution Control Research and he's speaking on behalf of the Southern Company and the Edison Electric Institute, EEI. Our next witness will be Dr. Steven Benson, Energy & Environment Research Center, the University of North Dakota. And our third witness is Dr. Richard Bucher, who is here from W.L. Gore and Associates, and was referenced by Senator Carper in his opening statement.

We want to thank you all for coming today and again like to remind you, I hope that somebody tipped you off that it's 5 minutes, and hopefully if there are some things that you didn't get out in your statement you can bring them forward in the question and answer period.

Dr. Monroe, we'll start with you.

STATEMENT OF LARRY S. MONROE, PROGRAM MANAGER, POLLUTION CONTROL RESEARCH, SOUTHERN COMPANY

Mr. MONROE. Thank you, Mr. Chairman, Senator Carper, Senator Cornyn. My name is Larry Monroe, and I work for the Southern Company. The Southern Company is a regional energy company serving some 4 million customers in the southeastern United States. I'm a chemical engineer and I work on finding effective emissions control technologies. I'm also speaking today on behalf of the Edison Electric Institute.

The state of power plant mercury control technologies is still in its infancies. There are no commercial technologies available. By that, I mean there are no vendors that are offering a process to the industry that includes a guarantee of performance. There are two near-commercial technologies available, the first is coke control by flue gas desulfurization systems, also called scrubbers, installed to control sulfur dioxide, called SO_2, and perhaps aided by nitrogen oxide, NOx controls. And the second of these technologies is activated carbon injection.

Mercury can exist in three forms at the exit of a power plant: the elemental vapor, the ionic form or attached to fly ash as particulate mercury. The form of the mercury in the flue gas determines how easily it can be removed.

Now to the first of the near-commercial processes, coke control by SO_2 removal, and possibly NOx removal processes. The most common sulfur dioxide control process is the wet scrubber, where powdered limestone and water are mixed with flue gas to remove SO_2. The ionic form of mercury is soluble and is also removed with relatively high efficiency in these scrubbers. Therefore, the amount of mercury control in the scrubber depends on how much ionic mercury is present, which is highly dependent on how much chlorine is in the coal.

The coals in the eastern U.S., mostly bituminous coals, contain significant amounts of chlorine and therefore produce maybe 60 percent ionic mercury. And the scrubbers in the limited testing done to date can remove as much as 90 percent of that, for a total mercury removal of 55 percent.

However, the coals found in the western U.S., mostly subbituminous and lignite coals, are naturally low in chlorine and produce only about 25 percent ionic mercury, which means that a scrubber would only remove about 22 percent of that mercury.

Claims have been made based on German research and now tested in the U.S. that selective catalytic reduction systems installed to reduce NOx converts some of the remaining elemental mercury into the ionic form, the form that can be captured in scrubbers. Testing conducted thus far appears to show that these NOx reduction systems do appear to help with the mercury chemistry but only for eastern bituminous coals and not at all for subbituminous and lignite coals. Studies at a very limited number of power plants suggest that this combination of NOx and SO_2 controls for plants burning eastern bituminous coals may increase the 55 percent mercury scrubber capture to around 80 to 90 percent, when a selective catalytic reduction system for NOx control is added.

However, the low chlorine content of the western subbituminous and lignite coals apparently prevents the selective catalytic reduc-

tion system from oxidizing the mercury, so the combination of NOx and SO_2 controls remains at the 22 percent mercury, due to the scrubber alone. Let me emphasize that these estimates in mercury reductions are based on tests at only 10 plants, less than 1 percent of the 1,140 plants in the country. Therefore, we have no way of knowing how many plants will be able achieve these States performance numbers.

The second near-commercial technology for mercury control in power plants is activated carbon injection. The very first full scale test of any mercury control process in the Nation was a test of activated carbon injection performed at a Southern Company plant, Alabama Power's Plant Gaston. I would be happy to give more details about activated carbon injection in the question and answers.

Finally, recent modeling by EPRI suggests that U.S. utility emissions of mercury are only a small contribution to deposition of mercury in the continental United States. Significant reductions of utility emissions will only reduce deposition in the U.S. by about 1.5 percent and will only decrease exposure of the most sensitive population, that is women of child bearing age, by one half of 1 percent in the year 2020 as compared to 1999.

In summary, there are no commercial technologies that I can buy to control mercury emissions from power plants. The two most promising, coke control with scrubbers, and maybe selective catalytic reduction, and activated carbon injection, are under investigation but still need further testing under various coal types, geographic locations and operating conditions. Both seem to work better for eastern bituminous coals, leaving us with no good technology choices for western subbituminous and lignite coals.

Southern Company and EEI understand that some mercury reductions will occur as SO_2 and NOx control systems are installed. But we can only guess at the exact amount. More testing and research is needed. Any regulatory program for mercury reduction must consider the state of the technology, the costs and the energy impacts of meeting the requirements. Failure to follow the right path will lead to significantly increased costs, further switching from coal to natural gas for power generation, and possible disruption of the Nation's energy supply.

I would be glad to answer any questions you might have.

Senator VOINOVICH. Thank you, Dr. Monroe.

Dr. Benson?

STATEMENT OF STEVEN A. BENSON, SENIOR RESEARCH MANAGER, ENERGY AND ENVIRONMENTAL CENTER, UNIVERSITY OF NORTH DAKOTA

Dr. BENSON. Thank you, Mr. Chairman, members of the subcommittee, for the opportunity to testify and share information on mercury control technologies and challenges for western lignite and subbituminous coals. My name is Steve Benson and I'm a Senior Research Manager at the Energy and Environmental Research Center at the University of North Dakota, where we have conducted research on mercury measurement and mercury control technologies for approximately the last 20 years.

The first thing I'd like to do is cover two main points. The first is that the west produces over 50 percent of the coal in our country.

And aggressive regulation could put western utilities and their customers at a serious economic disadvantage. The second point is that the configuration of western plants suggests that there is not a one fit for all solution to mercury control technologies in the west.

As Dr. Monroe mentioned, the form of mercury emitted from power plants is dependent upon the composition of coal. Western coals contain low amounts of chlorine and produce mostly elemental mercury in the flue gas. Western coals also contain high levels of calcium and sodium oxide that tie up the available mercury, further increasing the elemental form of mercury.

As compared to eastern bituminous coals that have higher levels of chlorine, the levels of the oxidized mercury in the flue gas dominates the form of mercury. The problem with elemental mercury is that it is not very reactive, and cannot be captured with most existing flue gas pollution control equipment. This represents a significant emission reduction challenge for western coals since a cost-effective commercial system for effective capture of elementary mercury is not yet available.

The most common western plant control configurations include electrostatic precipitators and fabric filters for particulate control and wet and dry scrubbers for sulfur control. Selective catalytic reduction for NOx control are not very common.

Currently research is underway on technologies for reducing mercury emissions from low-rank coal or western coal-fired power plants. These include activated carbon injection, upstream of existing electrostatic precipitators and fabric filters, oxidation of elemental mercury by chemical addition or catalyst for capture by wet scrubbers and dry scrubbers, and also some emerging novel approaches, such as mercury absorption by noble metals and other means.

The results to date have been varied. Existing research suggests that mercury removal by particulate and sulfur control is two to three times lower for western low ranked coals than for eastern bituminous coals. Fabric filters were the only particulate control device that appears to remove appreciable amounts of elemental mercury. But this has only been accomplished where the chlorine levels are sufficiently high, which is not typical of low-rank coals.

The technical challenges that need to be addressed include decreasing the quantity of carbon necessary to control mercury emissions, decrease in the impact of chemical additives on boiler corrosion, understanding ash blinding of catalytic oxidation systems, and the understanding of the impacts of coal variability. Western coal variability and composition, especially for lignites, has humbled many researchers and technology developers, including myself, in the past.

Most of the current research and development efforts have been conducted on a pilot scale. Long term field tests are needed to confirm the technical and cost-effectiveness of the most promising technologies and approaches. In addition, for any technology to be effective, we need continuous, reliable mercury monitors to measure both oxidized and total mercury species in the flue gases.

An additional issue is that fly ash produced by many western coal-fired power plants is a valuable by-product producing a rev-

enue stream. The use of activated carbon reduces the usefulness of this product and may require returning the fly ash and carbon materials back to landfills. Thus, in addition to the cost of activated carbon disposal costs would be incurred.

As I previously noted, cost-effective commercial mercury control technologies are not available for western lignite and subbituminous coals where the mercury is in the elemental form. Although an aggressive research and development program is being pursued, it is doubtful a cost and technically effective control technology will be available by 2007, an EPA regulatory target.

In summary, aggressive control targets could seriously disadvantage western utilities and their customers who rely on affordable power. Currently there is no commercially available technologies that can be applied to control mercury emissions from western coal-fired power plants. Significant additional research is required to prepare the western utility sector for implementation of mercury control standards.

Thank you. I would be glad to answer any questions.

Senator VOINOVICH. Thank you.

Dr. BUCHER.

STATEMENT OF RICHARD BUCHER, W.L. GORE AND ASSOCIATES, INC.

Mr. BUCHER. Good morning, Chairman Voinovich, Ranking Member Carper and members of the subcommittee. My name is Richard Bucher and I'm here to speak on behalf of W.L. Gore and Associates about some exciting technical advances that may offer a solution to the vitally important challenge of reducing mercury emissions.

Gore is a leading company in the field of advanced materials that provide creative solutions to longstanding problems. We believe that a new mercury capture system we have developed and that has been recently tested at the EPA may well offer dramatic improvements in the effectiveness, efficiency and cost of mercury capture from flue gas. We are excited by this development as an improvement of this kind in mercury control could greatly contribute both to the long term sustainability of power generation from coal and to the health of all Americans.

My employer, W.L. Gore and Associates, best known as the maker of Gore-Tex fabric, has built a reputation since the 1970's as a leading supplier of high performance filtration devices to our Nation's industrial applications. Beginning in the 1990's, Gore scientists and engineers have discovered and developed a series of radical improvements to our filters through embedding additional materials and properties into the structure of the filters that makes them work.

These advances have led to new applications for capturing over 99.99 percent of fine particulate to catalytically destroying over 99 percent of carcinogenic dioxins and most recently, for capturing over 90 percent of mercury in flue gas streams. The result is a cleaner, safer, healthier environment and more sustainable industry.

Our invention in the area of mercury capture has moved well beyond the lab bench and shows dramatic promise for the future. The

key to our technology lies in an increased capacity to capture and hold mercury, which allows the mercury collection function as illustrated in this figure to be moved from a consumable, as with activated carbon on the left, to a system component. That's with the Gore technology shown on the right.

The Gore system, which employs the same filter bags as the activated carbon system as shown here, employs the same filter bags for particulate control as a filter insert on the inside of the filter which contains the mercury control functionality. This system means that end users don't need any additional system infrastructure such as activated carbon silos or injection equipment or space. The fly ash is free of contamination, allowing plants to continue to sell as opposed to landfill this valuable by-product of the coal-fired industry.

And finally, the system is completely passive in nature. Once installed, it is always operating, continuously protecting the air we breath. It does not require additional operators, maintenance or monitoring.

Initial bench scale studies of our technology conducted at the EPA research facility in North Carolina demonstrate an unprecedented level of mercury capture, efficiency and capacity as illustrated in this figure. On the Y axis we have mercury capacity of absorbent, on the X axis we have various technologies. The red bars represent the absorbent capacities of activated carbons as reported in the literature, and the blue bars represent the advances made with the Gore technology. Some of these cases are up to two orders of magnitude or 100 times more efficient at capturing mercury.

Following this success, our most significant testing to date was conducted at the EPA on their pilot scale coal combustion unit. The 7 week trial with 24 hour operation was designed to test the long term viability of the technology under a variety of conditions. As shown here in this figure, mercury concentration of the flue gas is on the Y axis, various conditions on the X axis. The red bar is showing the amount of mercury coming into our filters. The blue bar is showing the amount of mercury leaving our filters. And again for a variety of conditions, both with western subbituminous coals and western lignite coals.

These results, assuming further successful field verification, will allow coal burning facilities to easily comply with the most stringent regulations set forth in the Clear Skies Act of 2003 and the Clean Air Planning Act of 2003. Our mercury technology is being designed to provide the benefits stated above, while potentially costing considerably less than carbon injection.

For example, activated carbon injection for a 110 megawatt facility, projected the EPA to cost $700,000 per year. When the lost revenue of unsalable fly ash is included, those numbers inflate to a range from $1.1 million to $1.5 million per year. Current estimates our technology could be 38 to 83 percent lower than those estimates, making our approach much easier to implement and more cost-effective.

Although we have not begun marketing this technology, our interactions with prospective customers have been nothing short of extremely encouraging. Owners and operators have expressed en-

thusiastic support of the concept, citing the ease of implementation, minimal impact on system performance, and most of all, the preservation of fly ash value, which is so critical to their bottom line.

I appreciate the opportunity to testify before you today regarding the important issue of mercury emissions control. W.L. Gore and Associates remains committed to developing innovative, economically feasible technology to address our Nation's air quality challenges. We look forward to continuing to work with the committee, the EPA and the coal-fired power industry to make this technology a commercial reality. Thank you again for allowing me to testify, and I'd be pleased to answer any questions you may have.

Senator VOINOVICH. I thank all of you for your testimony this morning.

The big question that we're laboring with is the issue of the tonnage that we have in the mercury requirement and the Clear Skies legislation. And as I mentioned earlier, there were many of us that were skeptical about those numbers, and feel that the more recent numbers coming from the EPA and from the Department of Energy are more reflective of reality. That's No. 1.

No. 2, there's obviously a difference of the three of you in terms of the state of technology. Mr. Bucher, you have testified that you've got some new technology here and that it's a lot more reasonable than the activated carbon. What is the difference in terms of the capital investment in regard to this, to the other technologies that are available? In other words, to install, we talked about the cost of operation, but what about the initial capital improvement? I'd be interested in that. And in addition to that, also the issue of how much testing has gone into this to the extent that the two other gentleman at the table here are a little skeptical about whether or not there is technology out there to deal with the particular coal that they've mentioned here at the table.

Mr. BUCHER. Certainly. The two approaches that I've outlined both include, most facilities today do not have a baghouse. The EPA has assumed that most facilities would adopt a baghouse, whether they're using activated carbon injection, that they pose as being the most cost-effective solution. Their numbers, which I based those annual yearly expenses, include capital expenditures, amortized over a period of years. So it's the total ownership costs of both technologies, to answer your first question.

To answer your second question, all the testing that we've done to date up until about 1 month ago has been confidential in nature. We have not shared it widely with the industry, which would explain why most people you would ask about mercury control from coal would not be familiar with our technology. We have done a 7-week long test at the EPA, like I mentioned, which is a short test but in the field of mercury control a relatively long test.

And it, granted, is on a small, pilot scale facility roughly the size of this room. We realize that more extensive testing is going to be required in the field, real facilities. And we have some plans in place to have that testing start beginning in the late summer to fall time period.

Senator VOINOVICH. I think the real question is that if you were a utility and got a new technology, the real issue would be how

good is the testing and for how long and how much does it cost and what do your bankers think of it.

[Laughter.]

Senator VOINOVICH. Dr. Benson or Dr. Monroe, would you like to comment?

Dr. BENSON. I think the key thing that we look at when we consider a technology that's out there and commercially available is that it has been demonstrated in the field for sufficient amounts of time. I guess that is the key. And pilot scale systems have their limitations. They don't always represent the variability of the fuels that you may see and they also may not represent the flue gas compositions that you're concerned with.

Senator VOINOVICH. Dr. Monroe?

Mr. MONROE. Specifically on this technology, I would just mention that only about 14 percent of the Nation's power plants have this baghouse technology installed at present. So that would require additional capital investments.

From my point of view, from a utility, I'd rather capture the mercury in a co-benefits, in a scrubber sort of system, whether an SCR is available or not. If I install a scrubber on a 500 megawatt plant, sort of a medium size plant, that's $75 million to $100 million investment for that. If I have to add a selective catalytic reduction system for NOx, that's an additional $50 million to $60 million. And to add the baghouse on top of that would be yet another increment of capital of $20 million to $30 million.

So I'd rather avoid that capital expense if I can perfect another technology. Once I have a baghouse, then to me it's a commodity question, does this technology work better, cheaper, faster that activated carbon.

More generally, I'd just like to point out——

Senator VOINOVICH. Let me see if I understand this. What you're basically saying is that you would get the scrubber and you'd get the SCR and try to get the best that you could from co-benefits and probably not invest in a baghouse, does that have to do with the activated carbon thing, the baghouse?

Mr. MONROE. Yes.

Senator VOINOVICH. OK. And that's what you try to do. And if that wasn't good enough, then you'd have to probably go to the activated carbon and the baghouse, and then at that stage of the game, you'd probably want to be looking at what Mr. Bucher is talking about?

Mr. MONROE. That's correct. Particularly in the current regulatory business as usual, in a MACT case, I may have to control mercury on every power plant. So I may install more baghouses under a MACT scenario than I would under Clear Skies.

I want to return to the testing, just to state that the electric utility industry is somewhat unique. We have to make the power as soon as someone needs it. We don't have any way to store it, aside from a few sort of off-peak storage systems there. So we require our equipment to run 100 percent of the time. Most industries, if you're talking about a refinery or chemical plant, typically design their equipment for 90 percent availability, so that it runs 90 percent of the time. It's not as crucial if they have to shut down their process

to fix something as it is in the electric utility business, particularly in Atlanta, Georgia, in the middle of an August afternoon.

So we require much more testing. We require more robust designs and long term testing before we can accept that equipment, just due to that unique nature of our business.

Senator VOINOVICH. Senator Carper?

Senator CARPER. Gentlemen, thank you all very, very much for illuminating testimony and I think in some respects very encouraging testimony.

Before I ask some questions of our witnesses on this panel, Mr. Chairman, I'd like to submit for the record a report from the Northeastern States for Coordinated Air Use Management. It's entitled Environmental Regulations and Technology: Controlling Mercury Emissions from Coal-Fired Boilers. It was published in September of 2000. The report examines the feasibility and the appropriateness of mercury control issues.

It concludes by stating that past experience suggests that further delay in the regulation of mercury emissions from power plants cannot be justified on the basis of concern about technology availability. On the country, delay is likely to stall efforts to advance promising control technologies. Mr. Chairman, I would ask that a copy of this report be included in the record, please.

Senator VOINOVICH. Without objection.

Senator CARPER. Dr. Bucher, let me ask sort of a follow-up question here from your testimony. What will happen to the promising technology that you've described and that we've seen demonstrated visually here, what will happen to this kind of promising technology if we simply pick a mercury cap that can be achieved due to co-benefits of controlling sulfur dioxide and nitrogen oxide?

Mr. BUCHER. Senator, I go frequently in front of our leadership at Gore in order to state the case for the business potential. And obviously they have many options on where to invest their funds for research and development. If we were not able to paint a clear case of potential market that it's going to be available and that we'd be able to sell our product into, it would be very difficult for them, justify it for me to ask for increased funding and additional research and development.

Senator CARPER. Dr. Monroe commented a bit on the feasibility and cost-effectiveness of implementing the kind of controls you were talking about. He mentioned the price of baghouses and all. Would you just think of it and just sort of respond to any thoughts that come to mind in response to what he's talked about. In the end, they've got to be able to produce electricity in ways that are cost-effective. We understand that. Would you just care to respond to anything he said?

Mr. BUCHER. Certainly. And clearly I see Dr. Monroe's point, that if you have a wet SGD scrubber system you can add an SCR for NOx and you can get those benefits that you need for mercury. That may be an attractive way to go. However, the EPA's reports are indicating that that is not always going to be the preferred technology. You're not always going to be able to achieve those mercury caps with those technologies. Their analysis has shoed that for most of these western coals that we're talking about, the subbituminous and the lignite, those systems, the most economi-

cally attractive solution is a baghouse with activated carbon injection. That's why we use that as the basis for our report to show how we could save those customers money over that solution.

Senator CARPER. When I visited with you and Chris Koons and others of your associates at W.L. Gore back in, I think it was January, you described another project. I think you referred to it as an advanced hybrid, as I recall. I believe it required, it removed almost 100 percent of, I think it was small particles, maybe 99.9 percent from coal exhaust. How is that different from the mercury technology that you've described here today, and what is the status of that advanced hybrid technology in the marketplace?

Mr. BUCHER. You're speaking of the advanced hybrid technology actually that the EERC, which Dr. Benson is from, was the inventors. Gore is the party that is commercializing the technology.

Senator CARPER. Dr. Benson, you were present at the creation?

Dr. BENSON. One of my colleagues actually did the development.

Mr. BUCHER. That technology, as you mentioned, is focused on controlling the fine particulate. It's really a more, it's attempting to be a more cost-effective solution than a traditional baghouse, as I picture it up there. An interesting story about when we first brought that facility up and running in Big Stone, South Dakota is, many of the operators, when they reported to work those first several mornings after the system went on line, they came into the control room and said, what's wrong? Why aren't we operating?

Because they had come to work and every day for 20 years, they come to work and they'd see smoke coming out of the smokestack. This time they showed up to work, there was no smoke, so they said, the plant's not operating. The controllers said, well, we're at full load. Just an indication of the ability of these advanced technologies to control emissions far beyond what it has been in the past.

And they're continuing to operate, right now actually that facility is down for a week of maintenance and they will be coming on line about a week from now.

Mr. MONROE. If I might comment.

Senator CARPER. Dr. Monroe, please.

Mr. MONROE. We are currently testing at one of my plants a competition to that device, using similar principles that was invented by the Environmental Protection Agency out of their North Carolina laboratories jointly with Southern Research Institute, a not-for-profit in Birmingham. So it's very intriguing technology to us, also.

Mr. BUCHER. And if I can add one more thing onto that, our mercury control technology is being designed to work with the traditional pulse chip baghouse, our advanced hybrid baghouse, or the co-pack baghouse that Dr. Monroe's referring to.

Senator CARPER. Mr. Chairman, I'm going to have to learn more about baghouses. Thank you all. I hope we'll have a second round here.

Senator VOINOVICH. Senator Cronyn?

Senator CORNYN. Thank you, Mr. Chairman, and I want to commend you for calling this hearing today on this very important subject, and thank all the witnesses for being here and sharing your expertise.

I know the Administration has put a lot of work into the Clear Skies initiative, and I'm grateful for their efforts. I think the framework proposed has potential, but I'm concerned about unintended consequences and maybe getting out ahead of the science before Congress seeks to impose some requirement that ends up being impossible to meet or certainly not possible within the economies involved.

But I'm hopeful that technology will ultimately provide some answers. But I guess my concerns, gentlemen, largely focus on two areas. One is the importance of maintaining fuel diversity. And second, on mercury removal. And I want to ask you in a minute about the technology, more about the technology that you talked about in terms of meeting the regulatory burden that would be imposed by the bill.

But in my State of Texas, as no doubt you know, coal, specifically lignite coal, must remain a viable energy source for Texas utilities. Forty percent of electricity in Texas is powered by coal. And I'm not convinced that there's enough natural gas there to counter-balance a drop in coal usage, particularly given the limitations that we've imposed on access to probable reserves of natural gas.

So we find, what I don't want us to do is find ourselves in a catch–22 where we get out ahead of technology, and I'm not in any way demeaning the promise, indeed, I'm hopeful, Dr. Bucher, that you and others are able to finally perfect the technology that will accomplish the goals that you seek. But I don't want to be in a position of imposing a requirement by law that results in reduction in fuel diversity and a dependence on ever-shrinking forms of energy and in the process, making electricity so expensive to consumers that it creates additional problems.

I've been repeatedly told by Administration officials that they think the technology will be available in the future to accomplish mercury removal. But I'm struck by the speculative nature, really, that tell us where we are at this point. And I know Dr. Bucher, your company, which I read is credited with producing Gore-Tex and other remarkable inventions, that you have maintained this technology as confidential given the proprietary reasons which I certainly respect, and you're not marketing this technology.

But I just would be interested, perhaps, to hear from each of you of the consequences of Congress imposing a standard today that there is not currently technology available to meet. Dr. Monroe, maybe you can respond to that first, please.

Mr. MONROE. We're sort of acutely aware of that problem, with the given regulatory program, with the MACT for mercury that we're struggling now, how do we continue to make coal-based power without these technologies available. I share your worry about fuel diversity. The southeast that my company serves is more heavily dependent than Texas on coal. We also burn, probably a third of the coal that we burn comes from the Powder River Basin in Montana and Wyoming, so that issue is very important to us also.

We see the speculative nature of we hope the technology is ready in time. We hear it again and again, the NESCAUM report that Senator Carper refereed to is sort of an article that reads that if you make a regulation, then the technology will suddenly appear.

Now, I'm a good engineer. My job is to make things cheaper every day, for my company. And so I work as hard as I can, and the regulations make me work to do that. But we could look at other examples of sort of technology approaches that didn't work. Fusion is one. The nuclear-solar sort of power that was always 10 years away and had been that way for 40 years running, the new kind of nuclear power plant.

Another example would be California's zero-emission vehicles, where they've just continued to redefine what those are and have never really reached the levels that were mandated by a State regulation there.

To get directly to your point, it really does scare us in the power industry to think we're racing toward some regulations or some legislative solution where we don't have the technologies, so that we're struck with a grim choice of not providing power to our customers or in violation of the law.

Senator CORNYN. I take it that you're not an eleemosynary institution that's involved in providing charitable services in the form of electric power. I guess there are economic you have to contend with in all of this.

Mr. MONROE. That's correct. And you know, being a regulated utility, I have State governments looking over my shoulder second guessing every move I make, also.

Senator CORNYN. Dr. Benson, would you care to comment on the challenges that are presented when Government mandates a standard for which technology is not currently available to achieve that standard?

Dr. BENSON. From the perspective of somebody that does the research and testing of the technologies, I think there's many technologies out there that show promise, like W.L. Gore technology.

Senator CORNYN. Don't get me wrong, I hope you're successful, ultimately. I'm talking about passing a law this sessions. So that's my concern.

Dr. BENSON. I think there are many technologies. It takes time, and there are many technologies in the laboratory right now and in the pilot scale that show some promise. There are a lot of issues that must be overcome with those technologies to move them into the demonstration stage. Once the technology shows the ability to have good performance during demonstration, the information can be used to develop performance guarantees. In addition, we need to understand impacts of the fuel variability issues on the performance of these technologies.

Senator CORNYN. Dr. Bucher, let me change the questioning just briefly a little bit and make sure I understood what you said correctly. Did you say that basically it's difficult for your company to get financing for a technology for which there isn't a currently mandated requirement?

Mr. BUCHER. I think I may have misled you there a little bit.

Senator CORNYN. I just want to give you a chance, I want to be fair to you and let you explain what you meant, if I misunderstood.

Mr. BUCHER. Certainly. I appreciate that.

Not difficult for us to obtain financing, difficult for our leadership, who's looking at a portfolio of places to invest their research and development money. They're going to put that in the area

where they feel they're going to have the largest chance for return. I'm a firm believer in our capitalistic system. And if the opportunity is there, it's so much easier for me to go in front of them and say, this is a great opportunity for not only us as a company, but for us to meet some of the needs of the Nation. So without that carrot, so to speak, it becomes difficult for them to embrace these kinds of programs.

Senator CORNYN. Thank you for clarifying that.

Mr. Chairman, my only concern would be imposing a standard and then just hoping and praying that there will ultimately be a technology available. That's my primary concern. Thank you.

Senator VOINOVICH. I share your concern.

Dr. Monroe, I'm sure you're aware, my State of Ohio relies a great deal on burning of coal, both from our part of the country and from some other parts. I'm really concerned about the whole issue of fuel switching. That's something that's very paramount in my thinking as the former Governor of the State of Ohio, and I'm concerned about the environment for our manufacturers.

Last year I had some real problems with Senator Jeffords' legislation on the four Ps, and my concern was that if it went into effect that it would force our utilities to switch to natural gas. Natural gas already today is really under stress, and the cost is escalating, in fact I think it's one of the reasons some of our businesses are in trouble today, because of the high cost of natural gas. And if we add to that problem fuel switching, I can see a lot of our industries either closing down or going some place else. That's not the United States, somewhere else in the world.

With the revelations expressed by the Administration on co-benefits and your extensive knowledge of the industry and technology available in regard to mercury emissions, what do you think would happen to the utility sector, and you're talking also for EEI, if the Clear Skies Act was passed as it's introduced?

Mr. MONROE. First, talking for Southern Company, we support the approach of Clear Skies. We would like to be working with the Administration and working with Congress on some of those details about the timing and the levels. EEI has a slightly different position than Southern Company on that.

Assuming it was passed as written, focusing specifically on mercury issues there, the SO_2 and the NOx issues are, as Chairman Inhofe mentioned earlier, there's not much uncertainty about NOx controls and SO_2 controls. We know what they cost. We know how they perform, although my company's been surprised as well as AEP, with the installation of selective catalytic reduction systems, with unintended consequences of those. So it's still not risk free for NOx.

Senator VOINOVICH. You're talking the SCRs?

Mr. MONROE. Yes.

Senator VOINOVICH. Yes. I'm well aware of that with the plume that they had. They actually had to buy out a town in order to eliminate a problem from that plume.

Mr. MONROE. Our problem has been slightly different. We have stopped up the catalyst. It has small holes about a quarter inch in diameter, several million in the gas flow pad, and we stopped every

one of those up and had to shut the plant down for that. So there are still risks there.

For mercury, as given the cap that's in place now, it would certainly cost more than I think most people think at the moment, because it would require an alternative to just the SCR for NOx and the SO_2 scrubbers to do the additional mercury control. So that then we would be very interested in W.L. Gore's technology. We would probably be looking at building baghouses for, not for particulate control, which we do a good job at, but only to add something, whether it's that technology, activated carbon or something that's invented in the meantime, some absorbent to just capture the mercury.

So that instead of getting sort of the benefits of the other investments that would require additional investments. It would make our coal plants more expensive to operate. We would probably shut down some of our marginal coal plants on that basis, and it would be yet another push for us to burn more natural gas.

Senator VOINOVICH. Dr. Benson, do you want to comment on that?

Dr. BENSON. I agree with Dr. Monroe.

Senator VOINOVICH. Well, in other words, what you're saying is, one of the things we're looking at is that we've got the 26 tons and we're talking about increasing that to 34 or between 34 and 46. How much of a difference would that make in terms of your situation?

Mr. MONROE. The cost to the industry would probably measure in the several billion dollars a year for that additional increment, because of the additional baghouses and activated carbon.

Senator VOINOVICH. So what you're saying is that 26 probably, that would mandate the baghouses and the activated carbon and that approach? And let's say, 34, that would not require that?

Mr. MONROE. I'd have to say that we do not know what that number would be. The problem we have is we've tested very few power plants. I can't tell you what that tonnage would be. It's certainly more, the co-benefits will leave us with emissions of certainly more than 26 tons. I think the range expressed by the Administration, 34 to 46, is probably in the ball park somewhere there.

Having worked with EPA on assumptions in their modeling, and they're proposing the 34 ton model, my opinion is, and again with my bias being a utility engineer, I think the technology is not quite as aggressive, it won't work quite as well as EPA. So I would tend to look at the higher end of that range.

Senator VOINOVICH. Well, the next issue is that if you had it at 34 rather than 26, how much influence would that have on the decisionmaking of people like Mr. Bucher and his company?

Mr. MONROE. It would simply be the extent of the market penetration of these other technologies that will add to the co-benefits. Certainly from an electricity price, if we have to do any more to get to the 34 tons, then the 26 would cost even that much more. It puts more pressure on the western coal users, whether they're in the west or actually buy the coal from the west, just because of the technologies that are available there.

The one thing that the Clear Skies approach does with the SOx is allow utilities like mine to take some risks on technologies. If I try a risky technology for mercury on a trading program, theoretically I can buy my way out of a failure by going to the market and buying those allowances, as compared to sort of a strict command and control MACT scenario, where I'd have to meet it at every plant. So that that scenario is much more costly, because I can't afford to take any risks on the technology, so I buy the most robust and therefore the most expensive.

Senator VOINOVICH. So the SOx is essential for you to have the flexibility to move on this area?

Mr. MONROE. Yes.

Senator VOINOVICH. Well, I think that we're not going to get that done today, we want to hear from the other witnesses, but I'd like to really get a sense of, if you went from 26 to 34, what it would have in terms of moving forward on new technology. Also then, you needed to look at the environmental benefits that you would get from the difference. That's something we haven't talked a lot about today. But maybe it's a subject of a hearing in terms of mercury and what it's contributing. I read half of it's natural and then half of it's caused by us, and a lot of it's caused by utilities. And do we, is there free mercury in the air.

In know one of the things in my State, because in our lakes we discourage people from eating our fish, particularly pregnant women, more than once a month or something because of the fact there's concern it might influence their baby. And so I need just a whole lot more information in that area. Because that's what we're trying to look at, is we're trying to improve again, getting back to harmonizing. We want to provide readily available low cost energy so that we can have a good economy and be competitive in the global marketplace. At the same time, we have to balance that in terms of our environment, public health and what we know in that arena. That's the real challenge that we have here sitting at this table.

Mr. MONROE. If I can make a few comments. I'm not a human health expert, I'm an engineer. But I follow that debate in the mercury issue. And I would encourage you to hear some more about the science of that. There's controversy about what low levels of mercury, and incidentally the only route of interest is actually through the consumption of fish for humans. That is the only thing we worry about for mercury exposure.

And there's two competing studies on health effects that sort of come to different conclusions. A follow-up to one of them was just published in the *Lancet* which cast some doubt on whether the referenced dose that EPA has set forward is, it suggested it may be much more conservative than necessary.

So I would encourage you and be happy to help supply suggestions for witnesses.

Senator VOINOVICH. I hope it's better than what we're getting on the issue of greenhouse gases and global warming. We've had several hearings on that, and if you listen to one side, it's one way, and you listen to the other side, it's another way. I've always found usually somewhere in between is where it really is.

Senator CARPER. We're not yet in full agreement on the need to address greenhouse gases and global warming. But at least, Mr.

Chairman, and I suspect Senator Cornyn as well are in agreement that SOx needs to be in whatever bill we enact. That's a good thing.

Dr. Monroe, I think you said earlier, I've just been thinking about this during the course of this conversation, that, are you a chemical engineer?

Mr. MONROE. I am.

Senator CARPER. And a utility engineer as well. Thinking about all the work that lies ahead for your industry, I just think, you've got pretty good job protection.

[Laughter.]

Senator CARPER. That's got to be a comforting thing.

Mr. MONROE. It's the best time to be in this job and at the same time the worst time to be in this job.

Senator CARPER. Our sons are 13 and 14, and we're talking about what they're going to be when they grow up. I'm going to walk away from this conversation thinking more about maybe chemical engineering as a promising field.

Earlier in your testimony, you referred to the NESCAUM report that I asked to be made part of the record. There was a question of whether or not, if we set a standard, a regulatory standards, somehow that incents industry to come up with ways to meet that standard. You used, I think, fusion as an example and said that it's always been 10 years away for the last 40 years. I would just, and I know I've heard that a lot myself, but fusion was never a regulatory requirement, which is an interesting point, never a regulatory requirement.

I would make another one of those unanimous consent requests while the chairman is not listening to me, and——

[Laughter.]

Senator CARPER. While he's talking to his close colleague and associate over there, Mr. Chairman, I'm sorry to interrupt, but I am going to ask, Senator Lieberman is not here today, he's not going to be able to join us. He's given me a statement he'd like submitted for the record. If we could do that, I'd appreciate it, and he would too. So I'd ask unanimous consent.

Senator VOINOVICH. Without objection.

Senator CARPER. Thank you, sir.

[The prepared statement of Senator Lieberman follows:]

STATEMENT OF HON. JOSEPH I. LIEBERMAN, U.S. SENATOR FROM THE STATE OF CONNECTICUT

Thank you, Mr. Chairman. I appreciate your convening today's panel on investor risk and climate change. While over the past few years we have already heard from many witnesses about the range of promising technologies to control pollutants from power plants, we have not yet heard about these issues from the perspective of investors. I am particularly pleased that Denise Nappier, the esteemed treasurer of my State of Connecticut, was invited to speak on this matter. I trust she will give an eloquent and persuasive presentation. As you well know, Mr. Chairman, I have long been concerned about the growing threat of global climate change and our nation's resistance to taking credible action to counter it. The science is now overwhelming and indisputable: carbon dioxide emissions are heating up the planet, and the longer we do nothing, the worse it will get. That is why I have introduced the Climate Stewardship Act with Senator McCain-the only legislative proposal on the table that would actually stem the increase of our nation's greenhouse gas emissions-and, with Senator Jeffords, have introduced the Clean Power Act, which would cut the emission of major pollutants from the nation's power plants.

But the Bush Administration's do-nothing policy on climate change is much more than a mammoth environmental problem. It also creates two other kinds of problems.

First, a foreign policy problem. Just this Tuesday, a troubling poll from the Pew Center for the People and the Press confirmed once again that our great nation's stature in the world is shrinking. Some attribute our loss of stature solely to the war in Iraq, but that's just not the case. Removing Saddam Hussein was the right thing to do, and much of the world will come to respect us for acting on principle. No, the core problem is that the world sees an American administration that on a broad range of issues is happy to lecture but not willing to listen. As Tony Blair has said, America must not only speak to the world. To truly lead, we must hear the concerns of our friends and allies, including the outpouring of concern about climate change and the consequences of America, the world's largest emitter of carbon dioxide, doing nothing to stem it. The fact is, America produces about a quarter of the world's greenhouse gases, but under the Bush Administration's neglectful watch has shown an unwillingness to produce any of the world's climate change solutions.

Second, the Bush Administration's neglectful approach to climate change creates a big economic problem. The ongoing regulatory uncertainty produced by the Bush Administration's refusal to act leaves businesses waiting, wondering, and spinning their wheels rather than making the long-term investments today that they would make if they were confident of how government would approach this problem. When it comes to climate change laws, businesses deserve more than instructions to place their fingers in the wind. They deserve an answer from us in Washington so that they can get down to the business of serving their customers, producing profits, and creating jobs.

Institutional investors see the problem quite clearly. Treasurer Nappier, for instance, is the steward of some $17 billion in pensions that are the nest egg of Connecticut's working families. Unfortunately, as we will hear from her, her ability to invest that money wisely has been impaired by the now chronic uncertainty surrounding what companies' obligations will be to abate climate change.

Mr. Chairman, my staff has talked with many investment analysts on Wall Street who tell the same story. There is a general understanding that constraints on greenhouse gases are an inevitable fact of the future. Analysts understand the size and the scope of the global warming problem and understand that America cannot keep its head in the sand forever. They understand that the climate is changing and executives are willing to invest in solutions-but they will put off those investments if they think the regulatory climate will keep changing each step of the way.

The Coalition for Environmentally Responsible Economies (CERES), a coalition of environmental, investor and advocacy groups, has long warned us of the strong link between climate change and investment risk. In its April 2002 report, Value at Risk: Climate Change and the Future of Governance, CERES warned that "there is mounting evidence that failure to respond to the risks posed by climate change could result in multi-billion dollar losses for U.S. businesses and investment portfolios." The report found a pressing need for corporate leaders and institutional investors to tackle climate change more aggressively, noting that "it is increasingly evident that the costs of inaction are likely to far outweigh the costs of action." The report went further to state that "climate change represents a potential multibillion dollar risk to a wide variety of businesses and industries. It should, therefore, command the same level of attention and urgency as any other business risk of this magnitude." Mr. Chairman, I ask unanimous consent for this report to be entered into the record.

The World Resources Institute also released a recent evaluation of the effects of climate change on shareholder value, in this case the value of oil companies. WRI found that different oil companies were positioned very differently on this issue, depending on how each company had hedged its risks in anticipation of policies to address global warming. For the companies that had acted wisely, WRI saw little impact; for those that had not done so, WRI saw a loss of more than 6 percent in shareholder value. Mr. Chairman, I ask unanimous consent for this report to be entered into the record as well.

Finally and most recently, CERES conducted a yearlong dialog among experts in the electric power sector, investors, and environmentalists on the issue of climate change. The resulting report, The Electric Power Sector, Investors, and Climate Change, due to be released today, concludes that the inevitable rise of carbon-regulating legislation, along with the direct financial consequences of climate change, justifies corporate and investor action. This problem, CERES has found, crosses industry and sector lines, and presents serious risks for all corporate shareholders alike.

Climate change is real and must be addressed. The heat is on the Administration to do something, do something decisive, do something credible, and do something soon. What John McCain and I have proposed is a moderate, measured, and market-based response to get us on the right track without creating a shock to our economy. It would help, not hurt, businesses crying out for a hint of what is to come. It would improve America's stature in the world. And most of all, it would protect America from the growing environmental threat posed by global warming.

Senator CARPER. I wondered if I could start off with Dr. Benson on this. A couple of times in the testimony today I've heard the term fly ash used. It sounds like it's a product for which there can be some value, or not. We have a large coal-fired utility, electric utility in the southeastern part of Delaware. And if anybody in the audience has ever been to Bethany Beach or Rehoboth Beach or Dewey Beach or Fenwick Island, or any of those great Delaware beaches, you've been not too far away from the Indian River power plant, which uses a lot of coal and create electricity for the Del-MarVa peninsula.

They create fly ash as a by-product of their operation. And the fly ash has elements in it, mercury among others, but it doesn't have a commercial value and it has to be landfilled, which is not inexpensive. And instead of having the ability to sell fly ash and make some money off of it, they have to figure out what they're going to do with it, and it costs money to landfill it. God only knows what kind of potential hazards that will pose for us later in this century.

Dr. Benson, any comments that you'd like to share with us no the cost-effectiveness of, or the economic value of dealing with fly ash and the stuff that goes into it, the mercury and what are the benefits for some of the new technology that we're talking about here with respect to resale of taking a waste product and turning it into something that has market value?

Dr. BENSON. The ability to utilize fly ash in various products, such as cement, use it for cement replacement, use it in other types of building materials, is dependent on the fuel composition, which dictates the fly ash composition. For western coals, there's a lot of calcium in the fly ash, so it's a great cement replacement material. By adding, for example, carbon based materials, it decreases the ability to utilize the ash, because the carbon interferes with the ability of the concrete formation process. So that's one of the issues.

So you want to look for alternative sorbent technologies, if there's another mercury sorbent, such as calcium silicate or something else that can be used, that does not interfere with the cement making process. Also the W.L. Gore technology, which does not use a sorbent or a carbon material, does not interfere with the process of utilizing the material.

The mercury that's absorbed into the fly ash based on our testing is fairly stable. We've heated the material up over 200 degrees to 300 degrees Centigrade and the mercury stays in the fly ash. So it seems to be stable once it gets there, with most technologies that we've been studying.

Senator CARPER. Dr. Bucher, I think you made some mention of fly ash in your testimony. Would you just go back and expand on that a little bit, at W.L. Gore, when you're thinking about how to make a product or a process that will have a return on your invest-

ment, how does this issue of turning fly ash into a marketable commodity figure in?

Mr. BUCHER. It figures in very strongly. As Dr. Benson indicates, some facilities today sell their fly ash, and as you indicate, some facilities do not. When we go and visit and talk to some of the plants that are currently selling their fly ash, when they think about one, not being able to get the revenue from selling it, and then two, paying someone to put it in the ground in a landfill, it's a very considerable delta that just drives them to find any solution that they can other than having to contaminate their fly ash.

So it's things like that that provide avenues for creative technologies to come in and solve those problems in a way that provides extra benefits to those customers, giving them further reason to employ, and as Dr. Monroe says, take some chances on some new technologies, because it will provide them that value in the end.

Senator CARPER. Thank you.

Senator VOINOVICH. Senator Cornyn?

Senator CORNYN. I don't have any further questions, Mr. Chairman.

Senator VOINOVICH. I want to thank you very much. This has been very, very fascinating, and it's certainly been helpful to me and created some more questions that I need to get answered. Thank you very much.

Our next panel, and I'll introduce them as they're coming forward because of our time limitations, and I apologize to them for their long wait. First is the Honorable Denise Nappier, Treasurer of the State of Connecticut. Dr. Margot Thorning, who's the Chief Economist for the American Council for Capital Formation. Mr. Wes Taylor, President of Production of TXU Energy. Mr. Jim McGinnis, Managing Director of Morgan Stanley. Mr. Douglas Cogan, Deputy Director, Social Issues Service, Investor Responsibility Research Center. And Mr. Mark Brownstein, Director of Enterprise Strategy, PSEG Service Corporation.

The chairman suggested that we try to—well, make sure that your testimony is within the 5 minutes. We would like to have some questions asked today and we're probably going to have to wrap up this hearing by 12:30 at the latest. Again, we appreciate your presence here.

We're going to start out with Denise Nappier, who is the Treasurer of the State of Connecticut. We're very happy to have you with us today.

STATEMENT OF THE HONORABLE DENISE NAPPIER, TREASURER, STATE OF CONNECTICUT

Ms. NAPPER. Good morning, Senator. I appear before you as an institutional investor and the principal fiduciary of a $17 billion pension fund representing 160,000 beneficiaries and plan participants. As Treasurer, I'm elected by the people of my State who like millions of Americans, seek to ensure their families' economic future through investments in the capital markets.

I appreciate the opportunity to testify about the relationship between climate change, corporate governance and the well-being of institutional and individual investors.

I know that you have testimony from others more expert than I on the science of climate change, so I won't go there. But I will share with you the perspective of an institutional investor who has the responsibility, the fiduciary responsibility, to consider the long term value of our pension funds.

We have all learned about a number of very painful but very valuable lessons following Enron and the corporate scandals that followed. We must not allow ourselves to lose sight of those lessons. We've learned about the disastrous impact on our investment savings, on our jobs and on the economy.

That is when transparency, accountability and an honest assessment of risk is not viewed by companies as priorities. As institutional and individual investors, we need accurate and complete disclosure information that could affect the current and future health of the companies we invest. And that goes beyond accounting to include among other things climate change as a risk factor.

Now, the consequences of those companies that do not act responsibly today and take steps to assess and mitigate the risks associated with climate change can be quite devastating. For example, companies could face the prospects of losing their competitive edge, incurring litigation costs or being saddled with unforeseen capital expenses just to name a few. And all these factors, all of these factors and others, can erode shareholder value and place today's seemingly solid investment in jeopardy.

Now, climate change may well be about our planet's future. But it is also about the financial risks to corporations and the impact on the retirement savings of millions of Americans. As a result, we have every right, as shareholders, to know what is being done about it and how America's corporations will protect their bottom line and thereby the value of our investments.

I believe that this issue is quickly becoming the leading edge of the next wave of corporate governance issues, and that the marketplace must begin to closely scrutinize companies to determine whether they have honestly, directly and thoroughly evaluated climate change as a risk factor and developed a proper response to it. In finance, where there is risk there can also be reward. A report by the Rose Foundation last year, the Environmental Fiduciary, reviewed the findings of a number of studies on this issue and concluded that in many cases, improving environmental performance provides a measurable boost to profitability and shareholder value, especially over the long term.

So we have a real opportunity here to not only protect our shareholder value, but also to achieve added value. Now, while you in Congress are debating the merits of a legislative response to climate change, such as whether or not to enact mandatory caps on carbon emissions, other nations are preparing to implement the provisions of the Kyoto Protocol, which include mandatory provisions.

Many of these companies in which we invest, particularly companies such as GE, Exxon-Mobil and Chrysler, operate in a global economy. For them, carbon regulation is not a future possibility, it is an imminent reality. And many State governments are also considering and enacting legislation addressing climate change.

Now, beyond the regulatory environment, shareholders are now advancing this issue. This year, resolutions on climate change were introduced at 23 U.S. companies and the Connecticut pension fund filed two of these and co-filed on a third.

Shareholders are asking companies to report on their greenhouse gas emissions, or to set a goal to reduce emissions or to report on the potential future financial risks to the company from their past, present and future emissions and to issue a plan to mitigate that risk. Some of these resolutions were withdrawn after productive discussions between shareholders and management. However, you should know that most of the resolutions were opposed by management and the directors. That opposition may prove to be shortsighted. That is penny wise and pound foolish.

At an annual shareholder meeting of American Electric Power, and I realize that my time—I need to wrap up.

Senator Inhofe [assuming the chair]. I'm sorry. We'll have to go on to Dr. Thorning. Dr. Thorning?

STATEMENT OF MARGO THORNING, SENIOR VICE PRESIDENT AND CHIEF ECONOMIST, AMERICAN COUNCIL FOR CAPITAL FORMATION

Ms. THORNING. Thank you, Mr. Chairman. I appreciate the opportunity to appear before this committee to comment on the impact of the Clear Skies Act and the proposals to cap carbon on the financial health of the utility sector.

First, the Clear Skies amendment is, while a challenge for the utility industry and in the judgment of many, not likely to significantly imperil the financial health and well-being of the utility industry. Carbon caps on the other hand are a different story. Some proponents of carbon caps suggest that this will give certainty to the investing community.

I think that the argument is flawed for three reasons. First, the goalposts are not likely to stay the same. The Kyoto Protocol targets, which were just discussed and which are similar to the targets in Senator Jeffords' bill, are not likely to hold. The European Union is already moving beyond the Kyoto target. Proponents of climate change measures there are suggesting targets of perhaps 60 to 70 percent reductions in CO_2 by the year 2050 will be required. And that's what they'll be discussing at the COP 9 meetings in Italy this fall.

So the goalposts are likely to shift, thereby increasing investor uncertainty and making it difficult for utilities to plan capital structures. If we go down this path of carbon caps, there will be increasing pressure from the European Union to try to keep up with them in terms of the targets that they are suggesting should be adopted.

Second, U.S. firms, if they accept these carbon caps, will be held to them. We have a different regulatory structure in the United States compared to the European Union. In Europe, there is much more flexibility between regulators and the regulated. Utility companies that fail to meet their emission targets, and by the way, Europe is not on target to meet its Kyoto targets, are likely to have much more flexibility and not face the draconian penalties that

U.S. firms would face if they failed to meet their targets. It's another source of uncertainty.

Third, as energy prices rise, if we put in place carbon taxes, the demand for electricity, the product is likely to fall as energy intensive sectors move abroad at an even quicker rate than they really are and consumer demand and industry demand falls. That's another source of uncertainty for the utility community, the demand for their product.

A better approach, I think, is based on the one the Bush Administration is advocating, which is an 18 percent reduction in greenhouse gas emissions per dollar of GDP over the next decade, compared to the 14 percent baseline forecast. One way to help achieve that goal is to take a hard look at U.S. Federal tax policy. A study that the American Council for Capital Formation Center for Policy Research commissioned recently showed that out of 14 countries, the U.S. has the slowest capital cost recovery for investments in energy assets. I ask you to note Table 1 in my testimony which I'd like included in the record. Table 1 shows that, for example, for transmission investments and transmission assets, U.S. investor only gets 29 cents on the dollar back after 5 years, whereas in Brazil they get 50 cents back on the dollar. In China, they get $1.04 back on the dollar. They are subsidizing those types of investments.

Similar story for combined heat and power and for investment in other energy assets. So as the Treasury study in the year 2000 suggested, because of the increasingly competitive nature of the utility industry, we need to take a hard look at the class lives and depreciation schedules that are provided for investments in those assets and speed them up, with a goal of making it easier for companies to make the kind of expenditures that will let them reduce CO_2.

Finally, I think we need to recognize that climate change and addressing the potential threat of climate change is a global problem. Imposing carbon caps on one industry and one country or even in the industrialized world will make virtually no difference in global concentrations of CO_2 in the next hundred years. Because the growth in emissions, for example, 84 percent of the growth in CO_2 over the 1990–2010 period is coming form China and Indian. So instead, we need a global solution that helps transfer existing technologies for clean coal and other energy sources to the developing world, so that they can try to meet the aspirations of their population for faster economic growth, as well as emitting less CO_2 and other emissions.

Senator INHOFE. We'll have to cut it off at that point.

Senator VOINOVICH. Senator Inhofe? During question and answer time, you'll both have an opportunity.

Mr. TAYLOR.

STATEMENT OF WES TAYLOR, PRESIDENT OF PRODUCTION, TXU ENERGY NORTH AMERICA

Mr. TAYLOR. Chairman Inhofe, Senator Carper, Senator Cornyn, my name is Wes Taylor and I'm President of Production at TXU Energy North America.

I appreciate the opportunity to appear at this hearing and provide TXU's perspective on Senate Bill 485, focusing on the capital

investment ramifications of emission reductions. As one of the Nation's largest energy providers, TXU made environmental stewardship a corporate priority long ago. Since 1990, TXU has added more than 2,600 megawatts of generation with zero air emissions. Our commitment to renewable energy has increased to the point where we are one of the largest purchasers of wind energy in the Nation.

TXU has been among the Nation's leaders in the voluntary reduction of greenhouse gas emissions, eliminating, avoiding or sequestering CO_2 emissions by more than 193 million tons since 1991. TXU has decreased its rate of SO_2 emissions by 38 percent, decreased its rate of NOx emissions by 70 percent and our SO_2 and NOx emission rates remain below the national average.

Despite these significant accomplishments, more remains to be done. TXU supports President Bush's efforts to reduce SO_2, NOx and mercury emissions through a three pollutant framework such as that used in Senate Bill 485.

I want to emphasize that this legislation must not cause the shutdown of power plants, which are vital to our Nation's electricity infrastructure, and also must not cause fuel switching that could impair fuel diversity and adversely impact our Nation's economy. TXU has a credible basis for issuing this caution. Our company has been an industry leader in the reduction of SO_2 and NOx emissions. We are very familiar with available control technologies and have a good understanding of both the cost and the effectiveness of these controls.

Unfortunately, S. 485's provisions regarding mercury emissions go well beyond co-benefits in phase one and the control technology to achieve these reductions is unproven and undeveloped. Therefore, no one has the ability at this time to fully evaluate the costs associated with controls necessary to achieve the mercury emission limitations contained in the bill, and this significant financial uncertainty may have the unintended consequence of causing plant closures or fuel switching rather than investing in SO_2 and NOx control technology.

The adverse economic impacts of such actions may be totally disproportional to the harm sought to be addressed by S. 485. The EPA itself states that less than 1 percent of global mercury emissions are produced by U.S. power plants. So I urge the committee to proceed with caution and understand all the facts concerning the economic and other impacts created by the public policy contained in this legislation.

I have submitted a prepared statement with additional details. I am also submitting for your use the 2002 environmental review of TXU, which contains details on our SO_2 and NOx emission reduction programs and documentation of our exemplary environmental record.

I respectfully request that my prepared statement and this report be included in the record of this hearing. In closing, I again want to thank you for the opportunity to be here and I'll be pleased to respond to questions.

Senator INHOFE. Thank you, Mr. Taylor. And for all of you, your complete statement will be made a part of the record.

Mr. MCGINNIS.

STATEMENT OF JIM MC GINNIS, MANAGING DIRECTOR, MORGAN STANLEY

Mr. MCGINNIS. Mr. Chairman, thank you. Senators, good morning. My name is Jim McGinnis, I'm a managing director of Morgan Stanley, the investment banking division, with responsibilities in providing advice on capital raising, restructuring and mergers and acquisitions involving companies in the energy sector.

Senator Carper, you might be interested to know my wife and I make our home in Greenville, Delaware, although my office is in New York.

Senator CARPER. I know that.

Mr. MCGINNIS. I focus my work on power and energy providers, utilities and on regulated competitors alike through a 14 year period characterized by nearly continuous and episodically chaotic structural change in this sector. The utility and power generation energy is a large user of investor capital at some $800 billion of institutional and individual investment dollars deployed in the Nation's power and gas utility and generation sectors.

Yet despite that large number, investor sensitivities to smaller incremental cash-flows requirements for debt repayments or new capital spending can sharply affect any individual company's access to capital. And an event related swell of concern in the market can and has in the past 12 months effectively cutoff access to capital for even large companies for significant periods of time.

I believe that this investor sensitivity drives a basic need for clarity in multi-emissions legislation. Capital providers to the industry can be expected to react poorly to financially significant expenditures required of utilities and unrelated generators in the context of potentially shifting requirements, on proven technologies and uneven regulatory treatment. This need for clarity has heightened importance now, at a time when industry participants have been roiled by unprecedented financial disruptions and failures, and by persistent uncertainties elsewhere in the public policy arena. Investors and company leaders are currently wrestling with an unprecedented variety of fundamental uncertainties, State by State changes and policies related to industry restructuring, purchase power contract disputes, as in California, accounting standard revisions related to energy purchasing, hedging and trading activities, uncertainty over aspects of currently pending legislation such as PUHCA reform, FERC transmission policy, transmission siting rules and transmission tax policy on transfers and ownership, and certain aspects of bankruptcy code reform, just to name a few.

One important attribute of legislation to reduce power generator emissions which supports the objective of clarity is the abundance of market signals from freely traded emissions allowances. Allowance trading improves the ability of affected companies to make clear choices as to the most cost-effective of various strategies they can employ in meeting emissions reduction strategies targets, and promotes capital efficiencies when capital is scarce.

Now a few comments on financial stress in the industry. The electric sector is in the midst, though perhaps the trailing end, of the worst ever period for credit rating deterioration. Since January 1, 2002, we have seen 232 separate rating downgrades, some of

multiple rating categories at one time versus 18 rating downgrades. These downgrades are a symptom of massive investor losses on bonds and bank loans to companies in the sector and the merchant power generation marketing in particular.

Also during the 2 years ending March 31, 2003, equity losses for investors have been staggering as well. I won't repeat some of the numbers that have been included in my written statement.

There are related impacts on utilities from the recent merchant power sector value destruction episode. In recent years, statewide restructuring in California, New York, Illinois, Texas, Pennsylvania, Delaware and Washington, DC. has resulted in large legacy generation portfolios of certain incumbent utilities to be transferred in those locations to unregulated power merchants, many of which have experienced a sharp decline in financial strength, and are counter-parties to the host utilities in meeting their demand needs for legacy customers.

Thus in evaluating legislation to reduce power generator emissions, which envisions one of the Nation's most ambitious private investment programs ever conceived, I would submit that the committee members examine several important market dynamics, multiple critical uncertainties in upcoming energy policy decisions, uncertainties related to fuel costs and availability and generally the weakened financial capacity of the industry's generation participants.

Thank you.

Senator Voinovich [resuming the chair]. Thank you very much.

Mr. COGAN.

STATEMENT OF DOUGLAS G. COGAN, DEPUTY DIRECTOR OF SOCIAL ISSUES, INVESTOR RESPONSIBILITY RESEARCH CENTER

Mr. COGAN. Thank you, Mr. Chairman and members of the subcommittee. My name is Douglas Cogan. I am the Deputy Director of Social Issues for the Investor Responsibility Research Center. I'm honored to have this opportunity to share with you an investor perspective of clean air legislation, especially as it concerns climate change.

Our Nation's electric utilities account for 40 percent of America's and 10 percent of the world's man-made CO_2 emissions. Addressing climate change necessarily involves this industry. Companies and investors that ignore this fact do so at their own peril. Investors loath uncertainty, as you know. Certainty will not be achieved until carbon dioxide is recognized as an emissions source that will be managed and controlled.

Electricity providers are poised to invest tens of billions of dollars to reduce power plant emissions of NOx, SOx and mercury. The concern of many investors is that the value of these investments may be compromised if they fail to address CO_2 emissions as well. A more prudent and certain approach would be to consider these four emission sources together as part of an integrated strategy.

Consider what Jim Rogers, chairman and CEO of Cinergy, one of the Nation's largest coal burning utilities, told this committee 2 years ago. He said, "Who will make a decision to invest a billion dollars in a new coal plant if you can only guess about future regu-

lation? A new power plant today that fails to address CO_2 will be as dated in 5 years as current law is today." Investors have raised this issue with electric utilities over the last 10 years through the filing of shareholder resolutions. With mounting support from large pension systems and endowments, shareholder support for corporate disclosure on climate change has increased dramatically.

At three of the Nations' largest electric utilities, AEP, TXU and Southern, the support level has reached almost 25 percent for the resolutions voted on in the last annual meeting season. Today you are hearing testimony about processes electric utilities use to analyze capital investment decisions relating to emissions control. Such analyses involving scenarios and decision trees are part of good governance practices with respect to climate change.

Yet when it comes to investor disclosure, these analyses are not yielding much useful information. Statements appearing in form 10(k) filings of electric utilities typically say that management is unable to predict the impact of the Bush Administration proposal or related climate change legislation, and that possible material impacts cannot be determined at this time. Such statements offer neither comfort nor guidance to investors. But they are typical in terms of the statements that we see in securities filings. That is one reason why shareholder resolutions seeking more information from management on climate change are setting record proxy votes.

Companies working with investors can take several steps to improve governance practices on climate change. IRRC in a soon to be released report commissioned by the CERES coalition of investor and environmental groups identifies 14 specific governance actions. I will highlight three vitally important ones here.

First, companies should provide regular assessments of the climate change issue to shareholders, based on systematic board reviews of company financial risks and opportunities. Second, companies need to set CO_2 emissions baselines and provide annual emissions data to investors, so they can gauge prevailing emissions trends. Most important, utilities should be making forward-looking disclosures of their CO_2 emissions. Investors cannot begin to make meaningful evaluations of the impacts of clean air legislation called here as the most aggressive clean air initiative in our history, until they have access to this forward looking information.

Congress can facilitate this process by requiring utilities and other major carbon emitters to report not only past emissions data but also future projections in their securities filings. To be fully transparent in this disclosure, aggregate emissions data, as well as emissions intensity ratios, should be provided.

The most helpful thing Congress can do, however, is to establish once and for all that carbon dioxide is an emission source that will be managed and controlled. Many investors see this coming. Regardless of the targets and time tables, this act alone will provide essential guidance for investors and company directors who now have climate change on their corporate governance agenda.

Thank you for this opportunity to testify.

Senator VOINOVICH. Thank you.

Mr. BROWNSTEIN.

STATEMENT OF MARK S. BROWNSTEIN, DIRECTOR, ENTERPRISE STRATEGY

Mr. BROWNSTEIN. Mr. Chairman and members of the committee, good morning. I'm honored to be here this morning to represent Public Service Enterprise Group and the Clean Energy Group.

PSEG is a diversified energy company with over $25 billion in assets and over $8 billion in annual revenues. Among the assets we own are 13,000 megawatts of electric generating capacity operating or under construction in New Jersey, New York, Connecticut, Pennsylvania, Ohio and Indiana. Clean Energy Group is a coalition of companies with more than 100,000 megawatts of generation capacity nationwide including coal, oil, gas, nuclear and renewable. The members of CEG, ConEdison, Entergy, Excelon, KeySpan, Northeast Utilities, PG&E National Energy Group, Sempra Energy and ourselves, are committed to promoting progressive environmental policies that are economically sound and sustainable.

PSEG, which celebrates its 100th anniversary this week, has long believed that environmental performance is one indicator of overall business performance. That being said, our eye is never off the bottom line. In our view, environment and economics are inseparable and as with many things in life, the secret to success is finding the right balance.

If you remember only one thing from what I say here today, please remember that one word, balance. For PSEG and CEG, the single greatest value to be derived from Federal multi-pollutant legislation, aside from the public health and environmental benefits themselves, is certainty. And the best way we know to achieve certainty is through a public policy outcome that strikes the right balance between environment and energy policy objectives.

I'm aware that this is the third hearing that you've held on the many questions surrounding multi-pollutant legislation, and I'm also aware that various stakeholders have come before you to argue that the current proposals on the table either go too far or don't go far enough. From day one, our goal in this debate has been to seek and encourage consensus. For we believe that it is only through consensus that we can achieve the kind of regulatory stability essential to the health of our industry.

You've heard from others here today about the importance of certainty, and I echo that concern. This is a very capital intensive industry, where large investments are made in assets that last 30 years or more. Making large bets on the future is an inherently risky proposition, and no amount of legislative activity on your part can offer us 100 percent certainty.

But to the extent that the trajectory of future environmental requirements looms large in the planning of any major player in our industry, you can make a significant difference by crafting legislation that clearly articulates expectations over the next 15 years, at least. The past two and a half years have been a tumultuous one for our industry. And we don't need any more excitement.

But where some people might argue that now is the wrong time to set new environmental requirements, we would argue that to take this do nothing approach would be to kill us with kindness. Whether you believe that the current oversupply of generation and capital crunch will last two or 5 years, the fact of the matter is that

current market conditions in our industry are part of a cycle. At some point, hopefully soon, companies like ours will begin to make new investments in our Nation's energy infrastructure. And when we do, it is critical that we have clear understanding of the environmental requirements we will have to meet. Otherwise, I feel we will be making suboptimal investments.

Nowhere is this more true than on the issue of carbon dioxide regulation. First off, let me state for the record as we've said many times in the past, PSEG believes that President Bush was right to reject the Kyoto Protocol. The reductions contemplated under that agreement demanded too much, too fast for our industry and our economy to handle.

At the same time, we think the issue of climate change is real, and we believe a domestic regulatory response is both necessary and inevitable. Given that our industry is singularly responsible for over a third of the Nation's greenhouse gas emissions and 10 percent of the global greenhouse gas emissions, we cannot and should not dodge this issue. With this perspective n mind, we believe that we are better off as a company and as an industry if we develop and implement a moderate response now, rather than wait 10 years, only to find that the political problem is now worse or that the environmental problem requires a more drastic response.

In the investment decisions that we have made in the interim, we're dead wrong. This is one of the reasons why we think the bill introduced by Senators Carper, Chafee and Gregg makes such an important contribution to this debate. We're encouraged by the leadership that the Bush Administration has shown on the issue of multi-pollutant legislation and we deeply appreciate the leadership that Senator Inhofe and you, Senator Voinovich, have shown in tackling this very difficult issue.

We encourage you in your efforts to find that balance that I talked about earlier, and I thank you for this opportunity to testify.

Senator VOINOVICH. Thank you, Mr. Brownstein.

Again, I want to thank all the witnesses for being here today. Dr. Thorning, we've heard several of the witnesses talk about the need to place a cap on CO_2 emissions to help the industry. However, if a cap is placed on CO_2 emissions, utilities, from what I understand, will be forced to fuel switch away from low cost, abundant and reliable coal to natural gas. As I'm sure you know, natural gas prices will only continue to increase as pressure becomes increasingly greater already in a tight market.

How have the increased natural gas prices over the past few years affected companies in other sectors, such as the chemical and agriculture industry's ability to invest in the market in general, and has it affected utilities that rely primarily on natural gas for their generation?

Ms. THORNING. That's an excellent question, Mr. Chairman, and I think most of the people in this room know that with respect to the higher natural gas prices, our chemical industry has been adversely affected, fertilizers, and others that are dependent on gas have been very hard hit and face reduced competitiveness, not only at home but globally. So industry has been very hard hit in terms of trying to maintain competitiveness.

The issue of placing carbon caps, which presumably would encourage fuel switching, is one that I think a lot of research shows would significantly increase natural gas prices and make it even more difficult for the U.S. economy to recover from its current slow growth.

Senator VOINOVICH. It is a major problem.

Ms. THORNING. It is a major problem.

Senator VOINOVICH. Is it affecting the stock prices of any of the companies that are highly reliant, for example, the chemical industry?

Ms. THORNING. Certainly it is. Stock prices have taken a very hard hit in the energy intensive sector. The surge in gas prices is certainly part of it.

Senator VOINOVICH. Thank you. Mr. Brownstein, the political reality we face in Congress is that the regulation of carbon will not become law. We went through that last year. It's not going to happen. And the whole issue is, in light of that fact, what is the wisest action for the Senate to take, pass a bill that provides certainty now for SO_2, NOx and mercury and get on with it, or should we just wait until the time comes when we deal with CO_2?

Mr. BROWNSTEIN. Well, certainly, Senator, I'm in no position, have no expertise to comment on political dynamics in this body or in Washington. I can only bring to you the perspective of my company and my shareholders, which is in a perfect world, I suppose, having some form of carbon price signal today would be much better for us than waiting.

I suppose the question of how our company would view legislation coming out of this committee or the Senate, and how we would feel about that, would depend a lot upon the details in it. But I'm hopeful that perhaps we can work with you and some others to help change some minds about the value of doing something on a moderate basis for carbon in the interim.

Senator VOINOVICH. Would a moderate basis not include a cap?

Mr. BROWNSTEIN. My view is that you need some type of price signal out there. We're very supportive, Mr. Chairman, of efforts to provide Government support for the development of IGC technology, geological sequestration of carbon. Coal is a very important of our generation mix and we want to make sure that it continues to be an important part of our generation mix. But at the end of the day, our concern is that as promising as those technologies are, without some sort of price signal that values the carbon benefit that they bring to the table, we're concerned that they will never be economic in the current marketplace.

Senator VOINOVICH. How much of your group's generating capacity is attributable to coal?

Mr. BROWNSTEIN. Generating capacity, sir, is about 21 percent or so, about 26 percent of the megawatt hours we generated last year came from coal.

Senator VOINOVICH. So it's about a quarter of all your group is coal generated?

Mr. BROWNSTEIN. That's right.

Senator VOINOVICH. I have, Mr. Taylor, I'm out of time. With the implementation of the Clean Air provisions, other Federal regulations and State clean air laws combined to create uncertainty for

electricity generators, they do have an impact on the ability of private sector utilities to raise capital and make strategic long term capital investments such as decisions on the purchase and installation of emission control technologies.

A prime example of this is the recent filing by PG&E National Energy Group which requested permission to shut down a 745 megawatt coal-fired plant in Massachusetts because it cannot meet the deadline to instal $125 million worth of SCRs and scrubbers. The New England independent system operator is likely to rule that the plant must stay on line in order to prevent blackouts, forcing either the State of Massachusetts to loan the money to the utility or the ISO to pay for the installation of the SCRs and scrubbers. In either case, the cost will likely be passed on directly to ratepayers. I'd like to add this article that recently appeared in the record. And I'd like to ask, is it reasonable to assume that we would see similar scenarios if Senator Jeffords' four P bill would have been enacted last year?

Mr. TAYLOR. Chairman Voinovich, I think that the addition of a fourth P to the legislation would exacerbate this problem and would cause the problem that this company had with their Salem Harbor plant to recur many more times around the Nation. Some of my fellow panelists this morning have talked about the certainty that would come by adding the fourth P to the bill. In my opinion, the only certainty that we would have from that would be the certainty that we would use less coal, use more natural gas and result in higher prices for both electricity and natural gas. I believe that it would harm our Nation's economy.

Senator VOINOVICH. Thank you.

Senator CARPER.

Senator CARPER. Again, this is another excellent panel, and we're grateful to each of you for making time in your lives to be here with us today and to share your input. Mr. Taylor, I'd just say, I'm the only native born West Virginia Senator in the U.S. Senate. I'm hoping to go to the Carper family reunion the first Saturday in August. I assure you, I don't want to go to that reunion having anybody there think that I'm not interested in the economic well-being of my native State and the coal industry within that State, from which I was born.

And you make an assertion that if we do take, given some balanced steps, reasonable, I think modest steps with respect to CO_2, and we include a cap and tarde system, the opportunity for sequestration really to use a lot of innovation, that we're going to see a wholesale shift from coal to natural gas. There's actually been some pretty good empirical analysis that says that's not really the case, at least when you take a reasonably balanced approach. And maybe we can have a conversation about that later.

But the last thing I want to do is push people out of coal and exclusively into natural gas. We're aware of the consequences of that for a company like Dupont, which is headquartered in my State. We're aware, we have a lot of agriculture in my State, and we're aware that as the costs of natural gas go up, it has an adverse impact on agriculture, too.

So for us, part of the challenge is to find ways to, as we look to control the emissions of CO_2, to do so in a way that doesn't lead

to this wholesale shifting away from coal and makes less economically viable some of our major industries, including chemicals and agriculture.

I was riding down on the train this morning, Mr. Chairman, and sometimes I read the paper. Today I was taking a look at the morning paper and I came across a small article in our paper from Delaware about a lawsuit that I think several States had filed against EPA to force recognition of CO_2. I think there were three States that were listed. And I believe Connecticut may have been one of the States.

I know you're not the Attorney, you're the Sate Treasurer. A more important job, I used to be State Treasurer of Delaware. Almost as important as the Auditor. What were you, the Auditor of, I know you were the major, were you the auditor?

Senator VOINOVICH. Of Cuyahoga County.

Senator CARPER. Another important job. But are you aware of the lawsuit that's been brought? I think it involved Connecticut, maybe a couple of other States.

Ms. NAPPIER. I am aware of the lawsuit, and it essentially says that the Federal Government should step up to the plate and identify CO_2 as a pollutant that ought to be regulated, that we should have uniformity as it relates to the need to lower emissions. And put it under the, I believe it's the P3 legislation, to make it P4.

Senator CARPER. Thank you. You were cutoff, you ran out of time and didn't have a chance to finish up your testimony. And I'm not going to go back and ask you to read it, but anything that you wanted to convey to us or just reemphasize?

Ms. NAPPIER. Yes, that shareholder votes in favor of climate change resolution has doubled over the last 2 years. I think that evidences the growing interest to properly address climate change, going out into the future.

The other thing is that CERES, which is a coalition of environmental groups and institutional investors, has had a year-long dialog on this whole topic. An important study is being released today as we speak here. I would hope that your committee would sort of avail themselves of that report, some important information coming out.

Last, that we do have a, I am calling for an institutional investor summit this fall that will take a very close look at climate change, what needs to happen to better quantify and assess the risks associated with climate change, along with the need to mitigate that risk. But a group of us will be coming together to do just that. And I believe that if we look at climate change as merely an environmental issue, we are missing the point. It is an investor security issue of the highest magnitude.

Senator CARPER. Thanks very much. Mr. Chairman, I hope we have another round, but thanks very much.

Senator VOINOVICH. Senator Cornyn?

Senator CORNYN. Senator Carper, unfortunately I had the misfortune to be Attorney General for 4 years in my State.

Senator CARPER. There are worse misfortunes.

Senator CORNYN. A whole State can't be held accountable for the actions of a single Attorney General.

[Laughter.]

Senator CORNYN. Mr. Taylor, I'm going to pick on you a little bit, because we come from the same place and your company is the largest electric generator in Texas. I'd like for you to clarify a few things for the record for me and for the subcommittee. Your company has a generation mix that includes coal, natural gas, nuclear and renewable. During our subcommittee hearings on the Clear Skies proposal, we've heard varying claims regarding the level of emissions controls that are currently in place at coal-fired plants. Would you give the subcommittee a sense of the emissions controls that TXU operates at its coal-fired plants and when those emissions controls were installed?

Mr. TAYLOR. Senator Cornyn, at TXU we have nine generating units that use lignite and coal. Five of those generating units had scrubbers installed at the time they were built. This was in the late 1970's, roughly 25 years or so ago.

Since that time, we have spent a great deal of money in upgrading those pollution controls and adding additional pollution controls. About five or 6 years ago, if memory serves correct, we added some, a device called a compact hybrid particulate collection system. It was very much like one of the systems that the gentleman on the second panel from the Gore company described as an advanced technology that removes very fine particulates. We spent $121 million installing that system.

We have spent $100 million, roughly, upgrading the scrubbers on our plant since 1995. We have spent $230 million on NOx controls at all of our power plants since 1997. So the total just since the early 1990's is in excess of $450 million.

Senator CORNYN. Well, obviously TXU has committed significant resources to control various emissions. Can you explain to us why the circumstances surrounding the proposed control of mercury emissions are different?

Mr. TAYLOR. Senator Cornyn, first of all, TXU very much supports the concept of the multi-pollutant legislation, and we certainly commend President Bush and the Administration on the introduction of it. We have a great deal of certainty with regard to how much it costs to control SO_2 and how effective those controls are. The same thing is true for NOx. We have no technology available for mercury control, other than what we get through co-benefits. We would be faced, under this bill as currently filed, with spending some $400 million to install additional scrubbers on our unscrubbed power plants, which we, by the way, are ready and willing to do. We would probably spend another $100 million or so on additional NOx controls, which we are ready and willing to do. But if we have to do that and also are facing a mercury control limit which we cannot meet, then our option would probably be that we would not install the SO_2 controls, not install the NOx controls, but simply shut down or fuel switch those units when 2010 gets here. I cannot overstate the difficulty that we would have in committing capital for further SO_2 and NOx reductions if we knew we could not comply with mercury reductions with any existing available technology.

Senator CORNYN. If TXU and utilities generally decide to just give up on coal and go natural gas, what are the financial prospects, what are the ramifications of that?

Mr. TAYLOR. We believe, first of all, that it would drive up our cost structure very considerably. The lignite and coal that we burn at our company is just over $1 per million BTU, I think $1.20 or so on average this year, if memory serves correct, whereas natural gas prices are currently $6. We're one of the largest generators in the United States, and it would add several billions a year to our cost structure. That would make the prices that our customers pay for electricity higher. We believe it would also drive up the cost of natural gas, and that would have severe adverse impacts on consumers, as well as for industry and particularly those industries that use natural gas as a feedstock, like the petrochemical industry and the plastics industry, for example.

Senator CORNYN. Thank you very much. I'll yield back my time.

Senator VOINOVICH. Mr. McGinnis, you've, and I apologize, I wasn't here to fully get your testimony, but the real issue here is, we have a kind of a patchwork, do source review, NOx SIP call, 126 petitions and so on and so forth. And we're trying with this Clear Skies legislation to come up with some sensible plan that will reduce emissions and improve public health and at the same time leave this country in a competitive position in terms of the global marketplace.

Sitting from your perspective, would the passage of this legislation make it more attractive for you to finance some of the things that Mr. Taylor talked about as contrasted from the current situation where we have all these other things that are in place?

Mr. MCGINNIS. Senator Voinovich, you address the question of whether it is easier to finance. There are going to be a number of issues, a number of inputs to market pricing of bonds and stocks. But I will say that a gist of the part of my remarks focused on the need for clarity. And investors seek clarity in an industry which has an environment of uncertainties, fundamental uncertainties related to regulatory policy and other matters.

So with respect to a Clear Skies bill, it does bring clarity on these three emissions. I'd also say that with respect to the adoption of additional restrictions on emissions that would use technologies that may be beginning to be introduced or being developed in R&D labs but are not yet proven with unknowable costs yet, doesn't help on the clarity point. It decreases clarity, decreases certainty with respect to how investors think about the future profits of those companies.

Therefore, more certainty is better here. I think more clarity would help investors get comfortable at a time of uncertainty otherwise, to put additional dollars into the companies that are going to need significant capital raised to embark on this emissions reduction program.

Senator VOINOVICH. There seems to be some strong opinion of some of the witnesses here that we have to add carbon to make it the fourth P. The issue is, if we did that, would that make it better for you or worse for you or wouldn't it matter?

Mr. MCGINNIS. Speaking from the perspective of investors and access to capital, the flow of funds, what would improve the flow of funds, what would make financing these more efficient. Adding a fourth P without the technology in place to getting to the emissions standards apply to the fourth P or clear costs associated with

the equipment required to meet those standards, potentially even technology to quantify the amount of the emissions creates more uncertainty than not having that fourth P in the bill.

So there would be a lack of clarity on what amounts the companies would have to spend over what period of time, because we don't have the technology in place to deploy.

Senator VOINOVICH. Do you have some of the same concerns over the issue, you've heard the testimony on mercury, the same concerns about that? We're struggling here with a number, and as I mentioned before, when we inserted the number into the legislation, there was a lot of people that said it was unrealistic because it was too low to take advantage of co-generation. How do you feel about that?

Mr. MCGINNIS. Senator, in particular, I would want to know what the costs would be. If I'm an investor in a company that is newly faced with an additional requirement for mercury reductions, before I make an investment of reasonable size, I would want to know what those costs would be to meet that new hurdle. And in the absence of such knowledge, I have to add that to the list of other uncertainties about that entity. I'm likely to migrate, my choice is likely to migrate to a company that has greater certainty perhaps in another sector.

Senator VOINOVICH. Thank you.

Ms. Nappier, the Energy Information Administration has projected that electricity prices would raise by some 25 to 30 percent if the 4-P bill was adopted from last year. Natural gas prices would risk dramatically. How could that be good for the shareholders of a utility and for that matter, and I don't know what the mix or where you get your energy from, but in a State like my State, where we would fuel switch, our manufacturers would have to pay about 45 percent more for their electricity and commercial about 35 and our homeowners about 25. How does it make it better if you add a fourth P to this legislation?

Ms. NAPPIER. Based on the way you've described the scenario, it would erode shareholder value.

Senator VOINOVICH. I'm sorry?

Ms. NAPPIER. I said, based on the way you've described the scenario, it wagtail erode shareholder value. You don't need to be a rocket scientists to understand that. My concern is this, that we need to have full, accurate disclosure of the climate change as a risk. We're not getting that kind of information from companies. We're asking companies not only to begin to quantify the financial risk but to also take steps to come up with plans that will help to mitigate that risk. And we want to know that. We want to know what it's going to cost our company in the long term and how it's going to impact shareholder value. We don't have access to that information.

There was a carbon disclosure project that was completed a while ago and surveyed 500 companies. Of the 500 companies that responded to the survey, 80 percent say that they are aware that climate change is a financial risk factor. But only 40 percent are doing anything about it. Only 40 percent are beginning, they're taking steps to assess the risks, financially, operationally, reputationally. Only 40 percent.

From my perspective, I want to know that. If what you're saying is absolutely true, in terms of my portfolio companies, like AEP, then that's vital information we need to make our investment decisions. And we don't have that information today.

Senator VOINOVICH. If the 3-P legislation, the President's Clear Skies legislation is passed, for sure you'll have certainty about that area, which is uncertain today in terms of most people's opinion. So that's, I would think, would be a step forward.

Ms. NAPPIER. Yes, I believe the 4-P legislation establishes a mandatory cap. But I'm not sure that that legislation speaks to the right of shareholders to have clear and accurate disclosure of information regarding a company's future health as it relates to climate change. I'm not sure it does that.

Senator VOINOVICH. I think that's something that——

Ms. NAPPIER. Regulation does bring on uniformity and that's good.

Senator VOINOVICH. The issue is you've got Dr. Thorning here, you've got Mr. McGinnis, is the fact that that information is available going to make a difference in terms of, do you think, in terms of the price of shares of stock?

Ms. THORNING. I'd like to weigh in. I think we need to keep our eye on the big picture, which is that addressing climate change is going to take a global effort. Shareholders in the U.S. cannot materially impact the growth in CO_2 concentrations. We need a global approach that will help the developing world where the growth is coming, slowly reduce their greenhouse gas intensity. Greenhouse gas intensity is falling in the U.S. If the Bush Administration plan is implemented and if tax provisions are made more favorable for pulling through the capital stock faster, we will be able to meet the targets, and shareholder value will be enhanced.

As I pointed out earlier in my testimony there are many uncertainties associated with adopting carbon caps, including the fact that the targets will continually tighten. If we go down that path, it's going to be very hard to get off of it.

Mr. MCGINNIS. I would just point out that while I'm sympathetic to the argument that developing a price signal, and institutional investors would like a price signal on what would happen with carbon emissions, again without knowable technologies and knowable costs and time tables, the price signal is distorted. So we wouldn't get a very clear read on what those costs would be. So it would create greater uncertainty rather than less.

Senator VOINOVICH. Senator Carper?

Senator CARPER. I want to revisit, and I'm sure we'll revisit this one a lot, but the assertion that our chairman made with respect to the cost of a 4-P bill versus that of a 3 pollutant bill. He mentioned 25 percent. I've not heard 25 percent, I've heard 3 percent. As we go forward, we'll have to find out, which is it, 25 or 3 or something in between. Because that's an important element here and an important factor in the decision that's before us.

I do know this, that 25 percent of the greenhouse gases created in the world today come from the United States. And I do know this, that 40 percent of the greenhouse gases that emanate in the United States come from our utility industries. While we're looking for a global solution, and there's clearly plenty of other sources of

greenhouse gases around the world other than just utilities, we as a nation are a significant contributor, and the utility industry is a significant contributor, too.

Mr. Brownstein, I just want to salute you and your utility also, those whom you mentioned, the utilities that are interested in trying to find a balanced approach to the problems before us. You said if we only remember one thing from what you said, leaving here today, you talked about balance. Just re-emphasize for us the critical point, and I'm going to ask Mr. Cogan to come back to a critical point that he would have us keep in mind as we leave here today.

Mr. BROWNSTEIN. And I think the discussion that's been had here this morning just in this last panel has illustrated that very nicely. There's no question, Senator, that if carbon caps are set in an unrealistic fashion, you're going to stress out the industry and create more uncertainty, as opposed to create less. That's one of the reasons why we think it's so important that No. 1, we be realistic about what we can accomplish in the near term, and No. 2, that we couple that with flexibility mechanisms.

Certainly, if you set a carbon cap and you limit the compliance ability just to within the industry, we're going to find ourselves in trouble very quickly. But if you set a carbon cap in such a way that it incentivizes utilities to go out and find low cost reductions in other industrial sectors and even around the world, I might add, our first wind turbine project was in Chile. Because it made sense economically and also was consistent with their developmental goals.

That if you incentivize through a cap program, you'll discover those costs. With respect to our friend from Morgan Stanley with whom we often do business, sometimes it's just a question of where you set the bar and how you share information between parties that give people confidence that there is a way forward. That's what we mean by balance. I certainly don't want to be in a position where we go forward and we make investments in NOx and SO_2 and mercury technologies, put off the climate debate for 10 years and find that we made a fundamental error in how we viewed the overall picture.

Senator CARPER. Thanks, Mr. Brownstein. Mr. Cogan?

Mr. COGAN. I would concur with everything Mr. Brownstein said, Senator. Two additional points I would make. Several references have been made during the course of this hearing, one to the patchwork of current regulations that are in place, and second to the question of uncertainty going forward. My concern in the research that we do for institutional investors is that neither of those issues, the patchwork of regulation or the uncertainty, will go away under a 3-P bill.

There is a patchwork in place right now with respect to carbon dioxide regulation. The vacuum in effect at the Federal level is being filled by some States that are passing their own legislation, regional air quality groups that are also looking at this issue, and certainly at the international level with the Kyoto Protocol and many countries that are implementing its terms.

So there is a patchwork that these countries and companies already have to deal with. That's not going to go away if there isn't a Federal standard that's put in place.

And the uncertainty won't go away either. The concern is that unless there's a dramatic change in the way the science of this issue looks, and the trajectories of the emissions being what they are, there's a misguided focus on the emissions intensity of production. But we don't want to lose sight of the fact of what the overall emissions trends are.

An analogy I might draw is to someone who has their cholesterol checked, and an emissions intensity ratio is a helpful piece of information if you know your HDL to LDL level. That's a good piece of information to have. But you also want your doctor to tell you what your overall cholesterol level is and whether the trend is up, and whether you're in a level where you're facing a greater risk of contracting heart disease. We don't want to lose sight of the fact that overall emissions in this country and in the world are continuing to rise and that therefore, the risk of climate change compounds going forward.

So the uncertainty will still be there in terms of addressing this issue. The one certainty that we would have with a 3-P bill is that we would be committing, as has been said again by Senators in this committee, to the most aggressive clean air initiative in history, very well intentioned and I think broadly supported in this country, but also very expensive. And the concern would be that as we get down the road, committing these tens of billions of dollars, we find that we're not going to be able to fully depreciate the value of those investments because we find that the science and the other concerns, the economic risks and opportunities posed by climate change are so compelling that we have to shift in midstream.

That's our concern. That's the fundamental uncertainty that we feel could be addressed.

Senator CARPER. Let me ask a question of Mr. McGinnis, and I think probably Mr. Cogan as well. Do you find that investors are shying away from the electric generating sector now due to the uncertainty of environmental regulations?

Mr. MCGINNIS. It's hard, Senator Carper, to understand when a stock price goes down what the specific ratio of rationale was, what one investor chose as his motivation to sell versus another to buy or more to sell for one reason or another. So it's hard to pinpoint. But in general, the focus on destruction of value in the merchant power sector has been from overbuilding in places which don't require as much supply. So environmental concerns from companies who have been focused on new construction have not been as important as concerns like access to financing and the spark spreads, or that is the margins that they experience from making power from gas-fired plants in certain regions to be robust.

So it's not been the prime driver of a lot of the issues for the industry. There have been cases, and RG is an example of a case which Ms. Nappier from Connecticut would be familiar with, in which pollution control and environmental issues, and NEG in New England, pollution control and environmental issues are very much a part of the economics of some of their investments. That has hurt those companies and that has hurt their share prices.

Senator CARPER. Mr. Cogan, do you want to take a shot at that question, please?

Mr. COGAN. Yes, you have to think about the type of institution that's holding the shares as well. The work that we do is largely for institutional investors who are managing pension, insurance and endowment assets. By definition, they tend to be in these companies for the long term. The trend has been toward index investing, and so you're in basically whatever is in the index and you're not going to sell it.

Electric utilities are a vitally important part of that index, as they are a vitally important part of our economy. So therefore, the institutional investors have to look beyond kind of the ebbs and the flows and the swings of this industry, again to see where the long term trends are and where it may head. That's why I continue to emphasize this need for a longer term perspective, a 15 year perspective perhaps, as Mr. Brownstein said.

The way I'd actually like to think of this issue in terms of a governance perspective for corporations and shareholders is that this issue presents a fundamental gap in governance decisionmaking. A CEO of a company typically is in that position for about three to 5 years and the investment planning horizon that a CEO has tends to match that same time interval.

In the case of a long-lived asset like a power plant, the investment planning horizon may look out 15 years. But the fact is, the power plant itself will exist for perhaps 30 or 40 years, and then emissions from that power plant, the carbon dioxide, will remain in the atmosphere for over 100 years. So long after the CEO is retired, even long after the plant is retired, there is the legacy of the emissions from that plant that need to be addressed. This is the gap in governance decisionmaking.

The way institutions can help close this gap is by recognizing that they hold assets that are as long, they span generations, they are intended to be in perpetuity if they're for endowments and pensions. They have that long term interest as well to see that the issues are addressed over the long term to maintain not only the vitality of the industry but of the economy as a whole, and the global environment as well.

Senator CARPER. Your mention of the long term, long-lived assets, let me just ask one last question for our State Treasurer, Ms. Nappier. Chairman Voinovich suggested earlier that Clear Skies will provide more certainty for the industry, at least in certain respects. But it's my impression that utilities invest on more like a 30 year time horizon. Do you believe that investors would benefit from having carbon dioxide on the table, given the length of these investments?

Ms. NAPPER. I'm not sure I understand your question. Investors are long term. You invest for the long haul.

Senator CARPER. Do you believe that investors would benefit from having carbon dioxide on the table, given the length, sort of the long term length of the investment cycle?

Ms. NAPPIER. When you say on the table, what do you mean by that? Do you mean regulated? I believe that regulation is inevitable. So if it's going to happen, then we should do it in concert with everything else that's going on that could have an impact on a company's long term health. So I'm very much concerned, for instance, what it will do to a company if you say today they have to

do X, Y, Z and make these capital commitments, and then 50 years down the road, all of a sudden, the rules change. And they're incurring additional expenses, unanticipated.

So we know that there is a need for more research and development to quantify the financial risk exposure to a company. And I would hate to have us move forward and just regulate for the sake of regulating and then realize that we have contributed immensely to the demise of an industry.

Senator CARPER. Thank you very much.

Senator VOINOVICH. Thank you. I'd like to thank all the witnesses for coming today. I thought this was a very interesting hearing, and certainly there's a difference of opinion between the witnesses here today. Thank you very much.

The meeting is adjourned.

[Whereupon, at 12:40 p.m., the subcommittee was adjourned, to reconvene at the call of the Chair.]

[Additional statements submitted for the record follow:]

STATEMENT OF DR. RANDALL KROSZNER, ACTING CHAIRMAN, COUNCIL OF ECONOMIC ADVISORS

Mr. Chairman, and members of the committee, I am pleased to appear before you this morning to discuss the Clear Skies Act of 2003. At this time, it is valuable to pause and reflect on this piece of landmark legislation. Strict enforcement of environmental rules can be dated as early as 1306-when a man was allegedly executed for burning coal in London. In the United States, concern for air quality dates back to the mid-nineteenth century, when many municipalities issued smoke ordinances. The responsibility of regulating air polluters rested almost exclusively with States and localities until 1970. The early 1970's marked an unprecedented increase in environmental awareness. During these years, the Federal Government began to take a more active role in environmental regulation with passage of the National Environmental Policy Act and the Clean Air Act. Later in the 1970's, the Clean Air Act Amendments of 1977 modified these air quality regulations.

One common thread over time has been that the United States' air quality regulatory policy, indeed environmental regulation in general, typically relies on command-and-control regulation. This type of regulation generally mandates technologies or processes, does not take advantage of the power of markets and is, therefore, by its very nature more expensive and less efficient than is necessary.

In contrast, the Bush Administration has crafted an initiative that will clean our air using a proven, market-based method. Announced on February 14, 2002, the Clear Skies Act would be the most significant and aggressive step America has ever taken, if enacted, to cut power plant emissions of three harmful pollutants sulfur dioxide, nitrogen oxide, and mercury. The proposal, which builds upon the highly successful 1990 acid rain trading program, will cut emissions by approximately 70 percent over the next 16 years.

Clear Skies employs a dynamic approach to regulation that mandates specific emission reduction caps while providing managers with the flexibility to reduce emissions in the most efficient and least costly manner possible. Through a market-based cap and trade program, Federal emissions limits, or caps, are set and emissions permits are distributed to electricity generators. Managers then have the advantage to determine the most efficient means of action whether it is the sale or purchase of unused allowances or banking of credits for later use. Clear Skies provides regulatory certainty and lays out the timeframes necessary for managers to design a cost-effective strategy tailored to both their current budgets and their future plans. With this structure, we uphold a principal feature of the President's initiative improving air quality more cost-effectively so that Americans can continue to rely on clean and affordable electricity.

To improve air quality, Clear Skies will achieve faster reductions than the current Clean Air Act by creating incentives for "overcompliance" and innovation power plants that develop means to reduce pollution more than or earlier than required can generate and sell extra credits. The Clear Skies Act will improve human health, visibility, and diverse range of ecosystems by reducing emissions and deposition of NOx, SO_2, and mercury. In short, Clear Skies will result in dramatic progress toward solving our nation's persistent air quality problems.

At What Cost?

As you are well aware, a crucial element of any regulatory policy is not only recognition of the benefits received from emissions reductions, but also the resource costs associated with the policy. These resource costs, it must be emphasized, are ultimately borne by citizens, whether stockholders of companies making the reductions or consumers, or both. Therefore, the Administration takes the economic modeling of Clear Skies quite seriously. In this respect, over the past several years we have gained a better understanding of the costs to abate NOx and SO_2. Yet, our understanding of the removal costs associated with mercury is in a nascent stage.

The goal of Clear Skies is to reduce mercury emissions by approximately 70 percent from current levels by 2018 with an interim cap reducing emissions by approximately 50 percent by 2010. That is, mercury emissions would be reduced from current levels of approximately 48 tons to 15 tons in 2018 with an interim cap of 26 tons in 2010. Consistent with the principal of improving air quality cost-effectively, Clear Skies is designed to meet the Clean Air Act goal of reducing mercury with a trading program that is more cost-effective than the program currently required by the Clean Air Act. The interrelationship of cap levels for NOx, SO_2, and mercury is also a key feature of Clear Skies for providing regulatory certainty, flexible capital planning cycles, and the co-benefit of mercury reductions from NOx and SO_2 emission controls.

The Administration has been examining, among other things, the total resource cost of achieving the mercury reductions required under Clear Skies, the marginal cost of mercury removal, and the level of mercury co-benefits that could be expected from the NOx and SO_2 limits in Clear Skies. We have also addressed what additional mechanisms and technologies will be needed to meet the 2010 mercury cap, using different assumptions and models. Major assumptions in our models have been extensively reviewed and, if necessary, updated over the past several months.

Before I share our latest results with you, I should highlight that any modeling of the effectiveness of mercury control technology is uncertain since mercury is not currently regulated in the power sector. Current modeling assumptions for mercury are based on data collected during the Environmental Protection Agency's (EPA) Mercury Information Collection Request (ICR), pilot-scale testing, and some full-scale testing. Because the data set we are working with is evolving, uncertainties exist in how to interpret the data. For example, emissions test data collected for EPA's ICR often reflect a large variation in mercury reduction on units with identical emissions controls and coal type burned. These differences most likely were associated with the operation of the control equipment, but additional testing continues to be conducted to understand these differences.

In general, there is agreement that selective catalytic reduction (SCR) technology provides enhancement of mercury reduction for bituminous coals. For subbituminous coal, however, there is some disagreement on whether SCR technology also provides this enhancement of mercury reduction. With only one set of test data on a subbituminous-burning unit currently available and more tests currently scheduled, this issue continues to be unclear, but more work is being done. For one of the most common coal plant configurations, a plant with a cold-side electrostatic precipitator for particulate control, the Energy Information Administration (EIA) and EPA agree that adding a SCR for NOx control and a scrubber for SO_2 control will result in 90 percent of the mercury being removed from bituminous coals. For subbituminous coals, however, the assumed percent removed ranges from 27 percent for EIA to 66 percent for EPA. There is an ongoing dynamic research process sponsored by EPA, the Department of Energy (DOE), the Electric Power Research Institute (EPRI), and vendors specifically aimed at furthering our understanding of mercury control, with new data being made available on a continuous basis.

With these uncertainties in mind, I will briefly highlight some of the empirical estimates of interest. As you may recall, the first phase mercury reduction cap in Clear Skies is designed to take advantage of the interrelationship of NOx, SO_2, and mercury emissions. More specifically, in addition to considering economic consequences and benefits of this multi-emission approach, we relied on an estimate of mercury removal achieved through installation of NOx and SO_2 controls (SCR and scrubbers, respectively). This removal estimate is commonly termed "co-benefits."

Concerning our updated empirical estimate of co-benefits, when the NOx and SO_2 limits in Clear Skies are modeled without a mercury cap (i.e., without a market signal promoting mercury removal), estimates of annual mercury emissions in 2010 after installation of NOx and SO_2 controls vary between 34 tons and 46 tons. An important point to understand in this context is that the mercury emissions remaining after installation of NOx and SO_2 controls are most sensitive to assumptions regarding emission modification factors, or EMFs, which is the amount of mercury removal assumed when particular combinations of NOx and SO_2 controls are in-

stalled. As discussed earlier, mercury reduction is dependent on coal type burned as well as the existing particulate matter, and NOx, and SO_2 control devices. For example, in the Administration's modeling, we assumed that a bituminous-burning unit with a SCR and wet scrubber can achieve 90 percent mercury removal. Other key assumptions including electricity demand growth, natural gas prices, and coal distribution patterns and prices, however, have not in isolation materially changed projected 2010 mercury emission levels.

While differences exist in this "co-benefit" figure, the Administration estimates the incremental costs of complying with the 2010 cap to be $650 million to $700 million per year. A key feature of understanding this cost is the safety valve mechanism in Clear Skies. This safety valve sets a maximum price of $35,000 per pound. Reducing mercury emissions to the level at which the "safety valve" would be activated between 27 tons and 30 tons is projected to cost between $650 million and $700 million in 2010. These costs reflect some units adding NOx and SO_2 controls to enhance mercury reductions, the addition of supplemental fabric filters with activated carbon injection (ACI) (approximately 6 GW of about 300 GW of coal-fired generation), and fuel switching between coal types. Little fuel switching to natural gas is projected as a result of the incremental costs of meeting the 26 ton cap.

In sum, the President's Clear Skies legislation calls for a 70 percent reduction in power plant emissions of NOx, SOx and mercury in the next 15 years. This legislation will meet the required health-based standards laid out under the Clean Air Act—but it will achieve those results sooner than required and at a much lower cost to consumers. We look forward to working with the committee and Congress to create a market-based system that will provide early reductions and affordable energy prices for consumers.

Thank you, Mr. Chairman. I look forward to answering any questions you or the members of the committee may have.

STATEMENT OF DR. LARRY MONROE, PROGRAM MANAGER OF POLLUTION CONTROL RESEARCH ON BEHALF OF THE SOUTHERN COMPANY AND EDISON ELECTRIC INSTITUTE

My name is Larry S. Monroe and I am the Program Manager of Pollution Control Research for Southern Company. Southern Company is a super regional energy company serving customers in Alabama, Florida, Georgia, and Mississippi. Southern Company is the second largest user of coal in the utility industry with some 21,626 megawatts of coal-fired generating capacity. I hold a Ph.D. in Chemical Engineering from MIT, and have been involved in research on pollution control for coal-based power plants for over 20 years in university, not-for-profit research institute, and corporate settings. At Southern Company, I manage a research group that evaluates, develops, demonstrates, and troubleshoots technologies to control particulates, SO_2, NOx, and hazardous air pollutants, including mercury, from fossil-fired power plants.

For the last 2 years, I have been engaged in the national effort to develop technologies to control mercury emissions from coal-fired power plants, resulting from EPA's decision in December 2000 to develop Maximum Available Control Technology (MACT) mercury regulations for coal plants. I serve as the utility co-chairperson of the EPRI program tasked with developing and evaluating mercury control technologies. I have also directed Southern Company's efforts, along with our partners including other utilities, EPRI, the Department of Energy, and the Environmental Protection Agency, in an attempt to develop cost-effective controls of utility mercury emissions.

I have been representing Southern Company and the industry on the Utility MACT Working Group, a subcommittee formed under the Clean Air Act Advisory Committee to provide advice to the Environmental Protection Agency. As a member of the MACT Working group, I have been intimately involved in the discussions with all of the stakeholders including the environmental community, the State/local/tribal regulatory agencies, and the industry stakeholders on the form of the regulation and its impacts on the industry and the price of electricity. As a part of this effort, I have been the leader of the industry stakeholders on advising EPA on our view of the performance and cost of the available mercury control technologies.

Working with EPRI, DOE, and EPA, Southern Company is one of the leading utilities in the national effort to develop mercury controls. We hosted the first full-scale power plant testing of mercury control ever performed in the United States, and are just starting a long-term follow-on test at the same site. Southern has also established a unique program to explore the fundamentals of mercury chemistry in coal power plant flue gas, partnering with EPA, TVA, EPRI, and several other utilities.

Today I am also testifying on behalf of the Edison Electric Institute (EEI). EEI is the association of U.S. shareholder-owned electric companies, international affiliates and industry associates worldwide. EEI's U.S. members serve more than 90 percent of all customers served by the shareholder-owned segment of the industry, generate approximately three-quarters of all of the electricity generated by electric companies in the country, and serve about 70 percent of all ultimate customers in the Nation.

State of Technology

The state of technology development for control of mercury emissions from coal-fired power plants is very much in its infancy. Some early efforts at measuring the mercury emissions from power plants were attempted in the mid–1990's, but the sampling techniques used were not adequate, and much of that data is questionable. The mercury content in typical coal-fired power plant flue gas is very low, measured at the parts per trillion level. A good analogy that describes the low concentration of mercury in coal-fired power plant flue gas is to imagine a pipe, one foot in diameter, built from the earth to the moon. If this pipe, all 238,000 miles long, were to be filled with coal-fired power plant flue gas, and the mercury all magically brought to one end, it would only take up the first 18 inches of this pipe. If we compare the mercury in coal-fired power plant flue gas to the other criteria pollutants (e.g., particulates, NOx, and SO_2) you find that the mercury is one million times less concentrated than those other species. The low concentrations of mercury, along with the propensity of mercury to react in the sampling equipment, contribute to the difficulties in accurately measuring and controlling mercury emissions at cost effective levels.

The state of knowledge of mercury chemistry and mercury emissions from power plants has been so scarce that, in 1999, the Environmental Protection Agency (EPA) required all power plants to sample their coal supply and test for mercury content, and required a selected number of power plants to sample for the different mercury species before and after the flue gas entered existing pollution control devices. Southern Company participated in that effort by tracking every coal to every one of our power plants and further by sampling two of our plants for mercury species and emissions. Unfortunately, this EPA Information Collection Request (ICR) data base, while suffering from some flaws in data collection and power plant selection, remains the best publicly available data base of mercury emissions, with and without controls, and of mercury chemistry for U.S. power plants.

There are currently no commercial technologies that are available for controlling mercury from coal-fired power plants. That is, there are no vendors that are offering process systems that are supported by guarantees from the vendor for mercury control performance under all the conditions that an ordinary power plant is expected to encounter over the course of normal operating conditions and timelines. Of course, there are vendors that will offer their best guess at how a particular technology will perform, but the risk of non-performance rests with the utility. The reliance on vendor warranties is standard practice within the utility industry, and the inability of the vendors to issue guarantees is indicative of the pre-commercial status of all mercury control technologies.

The most promising two technologies for mercury control in power plants are co-control by flue gas desulphurization (FGD) processes and the use of activated carbon injection (ACI) processes. To understand the co-control of mercury by FGD processes and the possibility of increased mercury control by NOx control processes, namely selective catalytic reduction (SCR) systems, a basic understanding of mercury chemistry is needed. First, coal is no different than any other solid material dug from the earth's crust when it comes to the mercury content. In other words, coal is not enriched in mercury compared to ordinary rocks. The mercury in coal is there mainly as a sulfide compound, at a concentration that averages 50 parts per billion by weight. These sulfur-mercury compounds are the most common form of mercury found in nature and they tend to be very stable solids, only dissolved by a mixture of strong acids. Most everyone is familiar with mercury, the metal that is a liquid at room temperature and used widely in thermometers and blood pressure instruments seen in a physician's office.

It is not a surprise that a metal that is liquid at room temperature would boil at much lower temperatures than ordinary metals, and mercury boils at only 674 F. Similarly, when coal burns in a utility boiler, mercury in the coal vaporizes and produces the vapor of the metal in the high temperature zones of the flame. This form of mercury is commonly referred to as elemental mercury, meaning that it exists in a form that is not combined with any other element. It is also known as "mercury zero," a reference to the chemist's shorthand of referring to the electron state of a pure element as zero, or Hg0.

As the temperature of the coal flue gas is cooled by the process of making and superheating steam, the elemental mercury vapor can react with other elements to form compounds. Our best knowledge of mercury chemistry suggests that mercury vapor can react with either chlorine or oxygen to produce mercury chloride (HgCl2) or mercury oxide (HgO). Since the electronic state of the mercury atom is now "plus two," this form is sometimes called "mercury two," ionic mercury, or oxidized mercury. These are all equivalent terms that describe the chemical state of the mercury. Finally, either of these two forms of mercury, the elemental or the ionic, can attach to solid particles, either fly ash or partially burned coal particles, and is typically referred to as "particulate mercury," which is a physical description of the mercury form. To summarize, we generally classify the mercury in coal flue gas as being one of three forms: elemental, ionic, or particulate.

The proportions of the three chemical forms of mercury have a great influence over the behavior of the mercury in the flue gas in pollution control processes. The particulate form of mercury is the easiest form to remove, with high efficiency capture being normal along with the coal ash in electrostatic precipitators (ESPs) or bag houses. Unfortunately, in most power plants, the fraction of mercury contained in the particulate form is only a minor amount of the total mercury.

Flue Gas Desulphurization (FGD)

The most common method to remove sulfur dioxide (SO_2) from coal-fired power plant flue gas is a wet scrubber. This device is a large tower, where the flue gas enters the tower near the bottom and flows upward, exiting through the top. When the flue gas is flowing, hundreds of nozzles spray a mixture of powdered limestone and water. The flue gas essentially flows up through a rain storm of these limestone-water droplets. Since SO_2 is an acid, it reacts with the alkaline limestone solids and is neutralized.

The acid and base chemistry is so fast that the performance of the wet scrubber is dependent on the mixing between the flue gas and the droplets. Therefore, it is necessary to use multiple, large pumps and a large number of nozzles to produce the small droplets needed. The combined limestone-SO_2 product from the scrubber is typically calcium sulfate, better known as gypsum the white powder found inside wallboard (also called sheetrock). Gypsum is a naturally occurring compound, mined both for fertilizer and wallboard.

In this common FGD process, the wet limestone scrubber, the form of the mercury in the flue gas entering the scrubber appears to be the most important factor in the efficiency of mercury capture. The ionic form of mercury, that which has reacted with oxygen or chlorine, tends to be soluble in water and is therefore captured along with the SO_2, while the elemental mercury, being insoluble in water, passes through most of these processes. Therefore, our best understanding of the co-control of mercury with SO_2 control processes suggests that the efficiency of mercury capture by these processes is related to the amount of the mercury that has converted from the elemental form to the ionic form. Anything that would help convert the elemental mercury to the ionic form will presumably increase the overall mercury control in plants equipped with wet scrubbers. (NOx control processes using selective catalytic reduction systems appear under some circumstances, and with some coals, to increase the amount of ionic mercury, and this will be discussed later.)

The biggest influence on the eventual form of mercury in the flue gas, and the apparent subsequent capture efficiency, appears to be the chlorine content of the coal. Coals with higher chlorine levels, when burned in a power plant, produce flue gas that is typically higher in the ionic form, the form which is most easily captured in an SO_2 scrubber system. In general, the domestic coals found east of the Mississippi River tend to be much higher in chlorine content than the coals found in the West.

More specifically, the rank of the coal tends to be a good predictor of chlorine content. Coal rank is an indicator of the age of the coal and there are four major classifications of coal rank, listed in the order of high rank (or older coal) to low rank (or younger coal): anthracite, bituminous, sub bituminous, and lignite. Most coal found in the Eastern U.S. is bituminous coal, although there are some lignite deposits found in the Alabama-Mississippi coastal plain. These lignite reserves are not important to the coal-fired utility industry, however. Conversely, most of the coal found in the Western U.S., including Texas, is either sub bituminous or lignite rank coal. The exception in the West is some bituminous coal found in Colorado extending into New Mexico. All of the coals in the Western U.S., including the Western bituminous coals, are characterized by low chlorine contents, while the bituminous coals in the Eastern U.S. have much higher chlorine contents. Therefore, the expected amount of ionic mercury and consequently the expected capture in a scrubber will be much higher for coals from the Eastern U.S. than from those in the Western U.S.

Typical coal-fired power plant flue gas produced from combustion of the bituminous coals found in the Eastern U.S. would contain the following proportions of the mercury species: 60 percent ionic mercury, 38 percent elemental mercury, and 2 percent particulate mercury. The particulate mercury would be removed in the power plant's electrostatic precipitator. We would expect the scrubber to remove 90 to 95 percent of the ionic mercury, and none of the elemental mercury. The overall mercury removal in this simple example would then be 56 percent (90 percent of the ionic and nearly 100 percent of the particulate mercury removed). This example is in good agreement with recent testing where, at three bituminous-fired power plants studied by EPRI, the FGD system removed 43 to 51 percent of the mercury.

However, most of the coals from the Western U.S. when used in a power plant produce much less ionic mercury, with typical estimates of: 25 percent ionic, 74 percent elemental, and less than 1 percent particulate. A scrubber on this power plant would then only be expected to remove 90 percent of the ionic and the electrostatic precipitator or bag house to remove nearly 100 percent of the particulate mercury. Therefore, the total mercury removal would be only 23.5 percent. The ICR data base shows that power plants burning low rank coals ranged from near zero to 38 percent mercury capture without wet scrubbers, and 11 to 56 percent on those plants with scrubbers.

A problem with capturing mercury in wet FGD scrubbers has been discovered through analysis of the EPA Information Collection Request data base. In some power plants that were tested for mercury species and also had wet SO_2 scrubbers, the apparent high capture of ionic mercury was offset by an increase in the amount of elemental mercury as the flue gas moved through the scrubber. So, while the ionic mercury appeared to be captured at efficiencies approaching 95 percent, some of the ionic mercury, after being captured in the scrubber, was converted back to the elemental form, which evaporated from the scrubber and was then emitted as elemental mercury.

An example may help explain the effect. Say that, before the scrubber, there are 10 micrograms (one millionth of a gram or 2 billionth's of a pound) of mercury in one cubic meter (about 35 cubic feet) of flue gas. Furthermore, let's say that 60 percent of that is ionic and the balance is elemental, or 6 micrograms per cubic meter ionic and 4 micrograms per cubic meter of elemental mercury. In a power plant that shows this mercury release phenomena, we might see less than 0.1 microgram per cubic meter of ionic mercury at the stack exit, an apparent capture of 98.3 percent of the ionic mercury. But, we see the stack exit containing maybe 5.5 micrograms per cubic meter of elemental mercury, an increase of 37.5 percent.

The elemental mercury is not being captured but is actually increasing across the scrubber. When looking at the total mercury, the 10 micrograms per cubic meter at the scrubber inlet is reduced to only 5.6 micrograms per cubic meter (5.5 elemental and 0.1 ionic) at the stack, a total reduction of only 44 percent. The only logical explanation to explain these example numbers is that some of the captured ionic mercury is being re-released as elemental mercury. In this case, the ionic mercury is only being captured at 73 percent, when the re-released mercury is included.

This scrubber mercury re-release is not well understood at this point. An analysis by EPRI notes a correlation between an increase in the amount of fly ash captured in the scrubber and an increase in the mercury re-release. Further work by EPRI on a bench-scale scrubber shows that this phenomenon is transient, and it is not easy to predict when it will occur. Additionally, private testing by Southern Company at our DOE-sponsored flue gas scrubber at Georgia Power's Plant Yates, south of Atlanta, has shown that this effect is present at some times, and not present at others. The significance of this effect is that the overall capture of mercury by a wet scrubber may be less over time than a short test period would indicate. Further research of this phenomenon is needed.

Most of the previous discussion assumes that the FGD process used is the wet limestone, forced-oxidation scrubber. Another process for SO_2 control, used widely for low sulfur Western coals, is a lime-based spray dryer followed by a bag house that collects both the reacted lime along with all of the coal ash. The EPA Information Collection Request testing in 1999 indicates that this spray dryer-bag house FGD process may give very high mercury removals with bituminous coals. However, this is a rare application of this technology, and unfortunately is not widely applicable to all bituminous coal applications. The technology is only effective for SO_2 control for low sulfur coals, is more expensive than the alternatives, and creates a large waste stream that has to be carefully handled for disposal. While this approach may be used in a few power plants burning Eastern bituminous coal for combined SO_2 and mercury control, I do not expect it to be very widely selected because of these limitations.

Ironically, the best application of this FGD process is for Western coals, but there it appears to make the mercury control worse than just particulate control alone. That is, the use of a spray dryer-bag house system on most low rank coals (sub bituminous and lignite) is normally the best engineering and low-cost FGD solution for plants burning these coals for SO_2 control, but the evidence suggests that it may worsen the mercury collection efficiency as compared to the use of a bag house alone. For example, EPA states that sub bituminous coal plants in the ICR data base with only bag houses average 72 percent mercury control, while those with a bag house and a spray dryer for SO_2 control average only 24 percent mercury removal.

Various technologies are being investigated to attempt to further oxidize elemental mercury to ensure higher removal in a FGD system. Chemical injection, plasma discharges, and dedicated catalysts are all being tested and developed. These approaches are all under development, and only slow progress is being made.

Selective Catalytic and Non-Catalytic Reduction (SCR & SNCR) NOx Controls

One of the most intriguing possibilities is the ability of NOx control selective catalytic reduction (SCR) systems to enhance the amount of ionic mercury in the flue gas. A report on research done by a large German utility company in the early 1990's claims that the catalyst used in a SCR system was effective in converting a high fraction of the elemental mercury to the ionic form, which was then captured in FGD equipment. The German claim was that the SCR catalyst changed the chlorine chemistry, making it more likely to convert elemental mercury to ionic mercury.

Based on this German research, EPA originally assumed that any power plant equipped with a SCR and FGD, burning any type of coal, would see: (1) almost all of the elemental mercury converted to ionic; (2) the ionic mercury captured in a scrubber in a high proportion; and (3) no mercury re-released from the FGD process all adding up to an estimate of an overall 95 percent reduction in mercury emissions from those plants. A 95 percent mercury capture would require that the SCR catalyst be 97.5 percent effective in converting elemental to ionic mercury. Furthermore, the FGD system would have to be 97.5 percent effective in removing the ionic mercury that is, not only does the scrubber have to perform at least as well on mercury as the SO_2 (even though the mercury is one-millionth times as concentrated), but no re-release of mercury can occur. EPA's assumptions were highly optimistic and recent power plant testing has shown these assumptions are not always true.

SCR catalyst degrades over time in its performance to reduce NOx, requiring replacement every three to 5 years. The catalytic activity is reduced by exposure to flue gas, either by poisoning of the catalyst active ingredient from the chemicals in the flue gas or by physical plugging of the catalyst surface by ash particles. It is not known, at present, how this catalyst deactivation affects its ability to oxidize mercury. The mercury oxidation of the catalyst could be reduced at the same rate as the NOx reduction, or it might be slower or faster. EPRI testing has only looked at two power plants and only in two ozone seasons (May 1 to September 30). So we have limited information, both in the number of plants tested and the time between tests. Therefore, any estimate of the long-term potential for co-benefits of SCR and FGD for mercury reductions must consider the possibility of catalyst aging and the subsequent potential loss in mercury oxidation.

For the lower rank coals, and particularly those found in the Western U.S., this SCR mercury oxidation does not appear to occur. Given the German claim of the effect being based on higher chlorine content, this is not much of a surprise. The low rank coals are typically low in chlorine, and to make matters worse, the ash of these coals is alkaline, so that whatever chlorine that is present, being an acid, is usually neutralized by the fly ash before it can ever reach the SCR catalyst. Testing in an EPRI program sponsored by utilities (including Southern Company) along with the Department of Energy (DOE) and the EPA has shown that mercury reduction in low rank coals do not seem to be helped by the addition of a SCR system. Since the majority of the mercury in the flue gases from these coals in the elemental state, the addition of any type of FGD system does not appear to control mercury emissions to any significant degree. In other words, for low rank coals (typically Western U.S. coals), we do see modest benefits on mercury control by adding wet FGD systems, but do not see any mercury co-benefits from adding an SCR to the power plants burning these coals. EPA has also seen the results of the testing, and we think that they have revised their assumptions about co-benefits for lignite and sub bituminous coal to reflect this new knowledge, that is, there are only modest mercury reductions based on co-benefits of NOx and SO_2 reductions for these coals.

At the beginning of the MACT development process, EPA had assumed that selective non-catalytic reduction (SNCR) systems would contribute to increased mercury

removal, and explicitly had assumptions about its performance in their models. SNCR uses ammonia injection at elevated temperatures (1900–2400 F) to reduce NOx without the use of a catalyst. Two years of testing have shown that this NOx reduction technology has no influence on mercury control in any plant with any coal rank. Finally, we think that the Agency has conceded this point and we hope that they no longer count SNCR as having any influence on mercury control.

Summarizing the current state of knowledge of controlling mercury via co-benefits of SO_2 and NOx reductions, there are only a handful of power plants that have been tested for short time periods. Given this limited amount of data, we think that for bituminous coals the mercury reductions with a SCR and FGD will probably be between 80–90 percent for the best case, and that for sub bituminous and lignite coals the reduction will be a modest 20 percent. These estimates are optimistic taking into account the previous discussions of catalyst aging in SCR systems and mercury re-release for FGD systems, and are likely to be reduced even further in the future. We think that EPA is currently using an estimate of 90 percent for bituminous coals and something less than 90 percent for lignite and sub bituminous.

Activated Carbon Injection

The second near-commercial technology for mercury control from coal-fired power plants is activated carbon injection (ACI). Activated carbon is a specially prepared product of coal or biomass that is able to adsorb many chemicals from gases or liquids. One of the primary uses of activated carbon is the treatment of drinking water. Water filtering systems sold for home use in home improvement stores are typically cartridge systems that include activated carbon as part of the filter. Activated carbon is being used currently to remove mercury from the flue gases from municipal, medical, and hazardous waste incinerators. In those applications, activated carbon can routinely collect over 90 percent of the mercury from the flue gas. However, the mercury concentrations in the stack after the activated carbon treatment in these incinerators are typically higher than that found in coal flue gas before treatment. That is, the amount of mercury in every cubic foot of incinerator stack gases after the control system using activated carbon is typically 5 to 10 times the amount in untreated coal flue gases from power plants. Another way to look at a comparison between incinerators and power plants is that most every power plant would meet the incinerator mercury regulations without any control technologies. Simply, incinerator mercury control by activated carbon stops where power plant flue gases begin. Therefore, it is not useful to use the experience of activated carbon in incinerators to inform the debate on its use in power plants.

The design of activated carbon injection for mercury control relies upon the existing equipment used to remove fly ash from the flue gas to also remove the added activated carbon. There are many side issues associated with the use of activated carbon in this mercury process approach, including contamination of the fly ash with carbon and interruption of the normal fly ash control by the added load of activated carbon. The injection ahead of electrostatic precipitators, which are in use by about 80 percent of the U.S. coal power plants, may require large amounts of activated carbon to achieve reasonable mercury control. The carbon will contaminate the fly ash making it unusable for recycling and may threaten the performance of the electrostatic precipitator for its intended use of removing fly ash. Injection of activated carbon in a bag house will not need as much activated carbon as an electrostatic precipitator, but will also contaminate the fly ash.

There have been only a handful of tests on the use of activated carbon to control mercury from coal-fired power plants. The very first test at full-scale in the United States was performed at a Southern Company power plant, Alabama Power's E.C. Gaston Unit 3, located in Wilsonville, Alabama. This was the first in a series of four power plant tests in a sequence performed by ADA-Environmental Solutions of Littleton, Colorado. The test program was sponsored by DOE's National Energy Technology Laboratory (NETL) with significant co-funding by participating utilities and vendors. All of these four sites are somewhat unique, and unfortunately do not well represent the nation's power plant fleet.

Gaston Unit 3 is one of only four power plants in the U.S. that have an advanced particulate control system that consists of a small bag house installed downstream of the existing electrostatic precipitator. This arrangement, known as COHPACTM, is a patented EPRI invention. The activated carbon can be injected between the electrostatic precipitator and the bag house. The electrostatic precipitator collects over 95 percent of the fly ash, while the bag house collects the remainder of the ash and the activated carbon. This approach to activated carbon injection avoids contamination of the fly ash and does not jeopardize the operation of the electrostatic precipitator with additional carbon loading. The bag house is a large filter, which has hundreds of fabric bags that separate the solid ash and carbon from the

flue gases, much like the paper bag in a household vacuum cleaner. Because the activated carbon can sit on the surface of the bags for several minutes and see a substantial amount of flue gas, it can effectively collect more mercury from the flue gas than injection into an electrostatic precipitator.

The activated carbon injection testing at Gaston, which burns an Eastern U.S. bituminous coal, ended with a 7-day test of mercury control, where the average mercury reduction over that time period was just under 80 percent, with a high of over 90 percent and a low of only 36 percent. This was a short-term test and probably does not reflect the ability of this system to always perform at this level. We found in this testing that the bag house at Gaston is not big enough to accommodate the amount of activated carbon needed to consistently achieve 90 percent mercury control for even just 1 week of testing. The testing was promising and DOE/NETL has funded a follow-on project that will test the mercury control at this location for one calendar year. This length of testing will allow a better estimate of the potential mercury control from this technology over the course of that 1 year. We are just starting this longer term testing, and the initial results were presented at an international pollution control conference sponsored by DOE, EPA, and EPRI just 2 weeks ago here in Washington. The initial results are not encouraging we cannot repeat the performance of the 7-day test performed in 2001. The electrostatic precipitator ahead of the bag house at Gaston Unit 3 is not performing as well as it was during the earlier testing, and we cannot inject much activated carbon into this system without causing damage to the bag house. Two conclusions can be drawn from the first few weeks of operation of the long-term testing: (1) the bag house at this unit is simply not big enough to handle both the fly ash and carbon loading over all operating conditions, and (2) the 80 percent average mercury control seen in the earlier 1 week test cannot be sustained over the long term. It may be possible to achieve levels higher than 80 percent in other power plants with this configuration, assuming that the additional capital investment is made to build a large bag house. Again, this is a test at a power plant burning Eastern bituminous coal.

The three other tests of full-scale mercury control using activated carbon in the joint industry-DOE project all involve the injection of activated carbon into the inlet of an electrostatic precipitator. The first electrostatic precipitator injection test was performed at Wisconsin Electric's (now We Energies) Pleasant Prairie Power Plant, which burns a Western U.S. sub bituminous coal from the Powder River Basin in Wyoming and Montana. This unit has a large electrostatic precipitator that is likely to be able to handle the additional particle loading from the activated carbon. The test that occurred over one to 2 weeks was able to achieve a mercury control of between 60 and 70 percent, but notany higher, regardless of the amount of carbon injected into the system. The logical conclusion from the testing seems to indicate that there is a chemical limitation on the amount of mercury control from low rank coals like lignite and sub bituminous, and maybe for Western U.S. bituminous coals from Colorado and New Mexico. It appears that, similar to the SCR oxidation of mercury, the activated carbon needs sufficient chlorine in the flue gas to collect the mercury. Again, this result was over a very limited time span test and may not be repeatable over a yearlong period. Longer term testing of this approach in several power plants needs to be performed before any judgment of the mercury performance can be reliably made.

An additional consequence became clear during the test at We Energies' Pleasant Prairie Power Plant. This site is able to sell all of the fly ash it produces for recycling into concrete. The activated carbon made the ash not usable for this purpose during the test period, but also contaminated the ash for about 4 weeks after carbon injection was discontinued. Southern Company declined a similar test at one of our sub bituminous coal plants, due to the expense of lost ash sales plus the added ash disposal costs.

The other two tests of activated carbon injection into electrostatic precipitators for mercury control were both performed in Massachusetts, at PG&E National Energy Group's Salem Harbor and Brayton Point power plants. Salem Harbor is peculiar in that it produces a large fraction of unburned coal particles that persist into the electrostatic precipitator, possibly a result of the large amount of South American coal being burned there. This high level of carbon produced seems to remove a significant amount of mercury, with a baseline removal ranging from 87 to 94 percent with one coal, but dropping to 50 to 70 percent with a second coal, all even before activated carbon injection. The activated carbon injection was able to increase the mercury capture to over 90 percent. Of course, this testing has shown that a change of coal supply can dramatically change the mercury baseline performance and the subsequent increased capture by activated carbon injection.

Brayton Point is also a peculiar arrangement with two electrostatic precipitators in series. In the DOE test, activated carbon was injected between the two electro-

static precipitators, much like the injection between the ESP and bag house at the Gaston station. The baseline mercury removal, that is, the removal before activated carbon injection started, was 90.8 percent. This is very high as compared to historical data from that unit that recorded baseline mercury removals of 29 to 75 percent. The results in the 10 days of testing suggest that, for short periods, the injection of activated carbon can increase the mercury removal from a baseline of 90.8 percent to 94.5 percent with the addition of activated carbon (10 pounds carbon injected for every million cubic feet of flue gas). Again, the short time of the test and the potential change in behavior with a change in coal supply makes it hard to extrapolate this performance much beyond the actual period of testing.

All of the electrostatic precipitator tests of activated carbon injection to date have involved relatively large, oversized equipment where the additional burden of collecting the injected activated carbon did not impact the operation, at least in the tests of under 2 weeks duration. For the same mercury collection efficiency as a COHPACTM bag house, the added carbon cost is substantial enough to justify the capital investment to build the bag house.

Another potentially large problem with this technology is that the supply of activated carbon is currently not sufficient to support any significant use for utility mercury control. I have publicly stated that, due to current uncertainties, Southern Company may use anywhere between 500 tons per year to 100,000 tons per year of activated carbon. The major U.S. manufacturer of activated carbon, Norit Americas, based in Atlanta, Georgia, have told us that they could supply an additional 20,000 tons per year with their existing capacity. Without long-term commitments from buyers, the activated carbon suppliers will very likely not make the needed investments to ensure that a large demand from the U.S. utility market could be met. In the 1970's, the activated carbon industry built capacity in anticipation of clean water regulations and those investments resulted in a severe price decrease caused by oversupply, when the demand did not appear. The activated carbon suppliers are not likely to make the same speculative capital investments today. Add to this reluctance to invest ahead of demand the fact that it will likely take at least 5 years to design, finance, permit, and build activation carbon production facilities, and it becomes apparent that, if activated carbon injection becomes the technology of choice for power plant mercury control, the supply will not be available at the beginning.

There may be foreign supplies of activated carbon. As discussed at a recent conference, there may be about 50,000 to 60,000 tons per year available from a major European supplier. Also, China has started supplying activated carbon into the U.S. market, but initial experience with this material has shown quality control problems with its performance. All in all, there may be sufficient carbon available to supply a small part of the industry with today's global supply, but there is not enough supply for any major use across the Nation by the utility industry.

In early modeling efforts by EPA on the performance of activated carbon, the assumptions made about performance and the actual amount of activated carbon were grossly optimistic. The Agency used some estimates made by DOE in 1999, and the subsequent testing at full scale power plants has demonstrated that the performance is not as good as the earlier estimates. We think that the current set of performance and cost numbers offered by the Utility Air Regulatory Group in the MACT Working Group are the best estimate for mercury control processes using activated carbon.

In summary, the limited testing of activated carbon injection for power plant mercury control does not represent the average configuration of the U.S. power plant fleet, and the short-term tests that have taken place only represent what a well-controlled and well-managed test period performance could be in other words, are likely to be close to the best case. Additional testing at the Southern Company plant has already shown that the earlier performance cannot be matched at this moment. Certainly additional testing, including long-term tests of at least 8 months are needed to understand what the actual performance of activated carbon injection over longer times would be, with the wide variety of coals in use today. At this moment, the DOE/NETL is evaluating a number of proposals from utilities, vendors, and research contractors to test activated carbon for longer periods of time on a variety of plants, especially those that burn low rank coals.

With sufficient capital investment to build a COHPACTM bag house large enough to handle both the fly ash and activated carbon, short-term performance of 90 percent mercury removal with bituminous coals may be possible, but, across the industry, an average removal of 80 percent is more likely to be achieved with today's technology. This estimate is based on only one power plant, tested for only 7 days, however. It appears that low rank coals, such as lignite and sub bituminous coals, may have a limit of 60–70 percent mercury removal, regardless of the amount of

activated carbon used or whether a bag house has been installed. Again, only one power plant has been tested for less than 2 weeks to establish this estimate. Under certain circumstances, activated carbon injection into a large ESP may be able to get incremental mercury control, but only two power plants have been tested for less than 2 weeks. Finally, the supply of activated carbon is not sufficient today to accommodate a substantial demand from the utility sector and it may take 5 years to bring new activated carbon production facilities on line.

Other Technologies

There are other technologies that show some promise in controlling mercury emissions from power plants, but they are all still research projects and are nowhere close to commercialization. Some of the multi-pollutant processes being developed do claim that mercury control is also removed along with SO_2, particulates, and NOx. While this may be true, there are large questions about the costs, reliability, and long-term performance of these technologies. Most of these multi-pollutant processes make either fertilizer or acid chemical feedstocks from the NOx and SO_2, and the ability to sell either of these waste streams in the future is questionable. The larger the penetration of these technologies into the utility market, the more of the byproducts that are produced, quickly over-saturating any potential market.

Possible future technologies that are being researched include capture of mercury by gold-plated surfaces, the use of chlorine addition to low rank coals to increase the mercury oxidation, injection of sulfur compounds to change the elemental and ionic mercury gases to solid sulfides that can be captured in the existing particulate control devices. Additionally, a large number of alternative sorbents to replace activated carbon, either with a less costly material cost or improved performance with less material injected, are under development. Unfortunately, we cannot predict whether these efforts will succeed, and we cannot base national energy policy on the hope that something is invented in time to produce the perceived needed level of mercury control.

Timing of Mercury Reductions

The timing of mercury reductions required, whether by regulations under a MACT provision or by a legislative process, needs to take under consideration both the state of knowledge about mercury control and the ability of the nation's utility industry to install the required controls. Already, in the installation of NOx controls for the 2003 summer ozone season, we have experienced some labor shortages and tight supplies of steel, cranes, and auxiliary equipment such as fans, pumps, electric motors, switchgear, etc. If mercury control proceeds under a MACT regulation, every coal-fired power plant will have to meet the stated emissions requirements, and depending on the technologies being used, we expect shortages of steel, bag house bags, labor, and auxiliary equipment, not to mention the activated carbon supply issues discussed earlier. Southern Company estimates that the time required to install mercury controls under MACT would be at least 7 years, and the time needed for the additional NOx and SO_2 controls in Clear Skies would take probably eight to 9 years.

Estimates of Benefits of Utility Mercury Reductions

EPRI and EPA are both engaged in research to attempt to predict the net effect on human health from reductions in emissions from U.S. coal-fired power plants. EPRI has just published their initial findings, and we think that EPA is working on similar model predictions. In the EPRI study, mercury deposition on the continental U.S. is predicted using a global mercury source and deposition model. The results indicate that the majority, around 70 percent, of the mercury falling on the U.S. is from sources outside the U.S. Additionally, this study predicts that U.S. utility emissions are estimated to contribute less than 8 percent of the mercury depositing in the U.S. This result is significant, because it indicates that reductions of mercury emissions from domestic utility sources will have a limited response on the amount of mercury depositing. In other words, since most of the mercury falling on the U.S. comes from overseas, controlling domestic utility emissions can have only a limited impact.

The EPRI study goes on to estimate the change in human exposure from significant reductions in utility mercury reductions. The only significant route of exposure to humans is through the consumption of large fish, captured in the wild. By estimating the change in U.S. deposition from reductions in utility emissions, the change in mercury in aquatic systems, and subsequently in fish, can be found. Taking the analysis one step further, EPRI has estimated the change in exposure to humans in the U.S. from utility mercury reductions.

The EPRI study looked at mercury reductions in a Clear Skies Act approach and in a mercury MACT regulation scenario. The results indicate under the Clear Skies

approach, in the year 2020, mercury deposition in the continental U.S. would be reduced by an average of 1.5 percent, exposure of women of childbearing age to mercury would be reduced by 0.5 percent, and the fraction of the population above the reference dose for mercury would be reduced by only 0.064 percent. In the MACT approach, also for the year 2020, mercury deposition would be reduced by 1.2 percent, exposure of women of childbearing age to mercury would be reduced by 0.4 percent, and the fraction of the population above the reference dose would be reduced by 0.055 percent. Since U.S. utility emissions are only a small contributor to mercury in the environment, it is not surprising that significant reductions in those emissions will not greatly affect human exposure. One significant difference in the two approaches is that the present value incremental cost for mercury controls by 2020 is estimated to be about $6 billion for CSA and $19 billion for MACT.

Summary

There are no commercially available technologies for mercury controls for coal-fired power plants. There are systems in use in the waste incinerator industry, but the EPA requirements for mercury control for incinerators allow emitted concentrations to be five to ten times higher than uncontrolled coal power plant emissions. In an engineering sense, the low concentrations mean that you have to work that much harder to get each molecule of mercury. NOx and SO_2 stack concentrations are one million times higher than mercury, so you have to work one million times harder to collect mercury as compared to either NOx or SO_2.

There are two near-commercial mercury control technologies at present: co-control by FGD systems, with possible beneficial mercury chemical changes from SCR systems on plants burning bituminous coals, and the injection of activated carbon into existing or new particulate control devices, either ESPs or bag houses.

Plants burning bituminous coal from the Eastern U.S. which have installed SCR systems and wet scrubbers are likely to have between 80 and 90 percent mercury control in the beginning. There are large uncertainties about the potential adverse scrubber chemistry that could re-release captured mercury and also about the extent of SCR catalytic mercury oxidation over time, so it is likely that these estimates may decrease as we learn more.

For low rank coals such as sub bituminous and lignite (along with bituminous coal from the Western U.S.), the SCR systems do not appear to have any beneficial effects on mercury chemistry, probably due to the low chlorine content of the coals. Additionally, the addition of a wet FGD scrubber system may increase mercury control slightly, say by 20 percent, but the addition of a spray-dryer FGD system may even decrease the mercury removal as compared to the pre-FGD mercury removal performance.

Activated carbon tests to date have been short, less than 2 weeks, and have shown some promise, but also some difficulties. The only long-term test that is being performed is at Southern Company's Plant Gaston, and the year long test is just beginning. The limited data from this one short test suggests that activated carbon injection into a COHPACTM bag house installed at a plant burning bituminous coal may be able to achieve short-term performance of 90 percent mercury removal, but an average across a year is more likely to be around 80 percent. We do not know what operation problems may occur after an extended period of activated carbon injection, but even at the beginning of the year long test, we are not able to match the previous short term performance.

Activated carbon injected into an electrostatic precipitator at a plant burning Powder River Basin sub bituminous coal has shown mercury removal of 60–70 percent, but only for a short test, and with serious consequences for ash sales and disposal. The chemistry of low rank coals like these may limit the final mercury removal that can be achieved with activated carbon. Again, based on this one power plant test for a short period, it is likely that a bag house and activated carbon injection would still only achieve 60–70 percent mercury removal on these coals.

Activated carbon supply is also an unanswered question. Activated carbon vendors have estimated the U.S. utility market may be between 500,000 and 1,500,000 tons per year. Between domestic supply and spare European capacity, there may be up to 150,000 tons per year available today. Without firm commitments, the suppliers are unwilling to make the investments to increase the supply, indicating that widespread use by the utility industry may create a worldwide shortage of activated carbon. Given that it takes roughly 5 years to bring a new activated carbon production facility on line, the prospects for widespread availability of activated carbon may be questionable.

In addition, the shortages encountered during the installation of NOx controls over the last several years have shown that shortages of labor, steel, cranes, and auxiliary equipment can occur, and installation of mercury controls under a MACT

regulation or installation of more NOx and SO_2 controls will surely cause even greater material and labor shortages. The only way to alleviate the shortages is to extend the required performance date to install the equipment. These shortages could spill over into other industries and cause price increases across the board.

There are other technologies under development for mercury control, but they are all very much still in a research stage. Various multi-pollutant processes are being touted, but they suffer from questions about performance, cost, and waste disposal issues. Other processes to specifically affect or capture mercury are also under development, but are at least eight to 15 years away from deployment, if they work at all.

More tests and longer tests are needed to be able to reliably estimate performance and design the appropriate equipment and processes for mercury reductions in power plants with different equipment installed and burning different ranks of coal. The Department of Energy is currently evaluating a number of proposals from the utility industry, vendors, and research organizations to test a wide variety of plants and coals for mercury control, over a longer test period. The electric power industry, along with EPRI and equipment vendors, is engaged in a large, coordinated effort to develop and optimize cost-effective mercury emission reduction processes.

EPRI modeling suggests that U.S. utility emissions of mercury are only a small contributor to deposition of mercury in the continental U.S. Significant reductions of those emissions, either under a CSA or MACT approach, will only reduce deposition in the U.S. by 1.5 percent, and will only decrease exposures of the most sensitive population of women of childbearing age by 0.5 percent in 2020, as compared to 1999.

The utility industry does not have proven technologies to reduce mercury emissions, but we know that some reductions will occur as SO_2 and NOx control systems are installed, either under Clear Skies or business-as-usual. The industry does not hold the position that mercury reductions should not occur, but asks that right timeline should be followed, one that considers the practical aspects of the cost and impact of making these reductions. Mercury emission reductions that are required before the technology has been fully developed will lead to significantly increased costs, to likely fuel switching from coal to natural gas, and to possible disruption of the nation's energy supply.

STATEMENT OF DR. STEVE BENSON, ENERGY AND ENVIRONMENT RESEARCH CENTER, THE UNIVERSITY OF NORTH DAKOTA

Thank you, Mr. Chairman and members of the subcommittee, for the opportunity to testify today. My name is Steve Benson, and I am a Senior Research Manager at the Energy & Environmental Center (EERC) at the University of North Dakota in Grand Forks, North Dakota. I have conducted and managed research, development, and demonstration projects on combustion and environmental control systems for the past 25 years.

The EERC has worked in the area of mercury research for over 20 years through projects supported by U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), State agencies, and industry and is recognized as a world leader on mercury measurement and control. One result of this work has been the establishment of the Center for Air Toxic Metals (CATM). Specifically, the EERC has conducted work in the following areas related to mercury emissions from coal-fired power plants:

- Mercury science and chemistry
- Mercury sampling, measurement, and speciation in flue gases
- Transformations of mercury forms during combustion and gas cooling
- Mercury sorbent development and testing
- Bench-, pilot-, and field-scale demonstrations of mercury control technologies
- Mercury oxidation technologies
- Coal properties impacts on mercury control

Today, I plan to provide a perspective on the challenges of controlling mercury emissions from power plants, with a focus on the issues related to western low-rank coals. Specifically, I will discuss the impacts of coal type on mercury speciation and control, options for control, and challenges to overcome.

Mercury Speciation and Control

Mercury emissions from utilities burning U.S. coals were determined under EPA's Information Collection Request (ICR), which mandated mercury and chlorine analyses on coal shipped to units larger than 25 MWe during 1999 and required emis-

sions testing on 84 units selected to represent different categories of air pollution control equipment and coal rank.

Based on ICR data, western coals (lignite and subbituminous) on average contain lower levels of mercury, chlorine, and sulfur than either eastern Appalachian or interior bituminous coals. Western coals are also distinguished by their much higher calcium and sodium contents. These differences in constituents have been shown to have important effects on the quantity and form of mercury emitted from a boiler and on the capabilities of different control technologies to remove mercury from flue gas.

The high chlorine content that is characteristic of eastern bituminous coals has been consistently shown to increase the fraction of the more easily removable oxidized form of mercury in the total mercury emission, as reported both in ICR tests and other mercury emission studies. Conversely, the experimental results indicate that the low chlorine content of western coals is associated with the emission of predominantly elemental mercury that is substantially more difficult to remove. The high calcium content of western coals appears to further reduce the oxidizing effect of the already low chlorine content by removing part of the chlorine throughout the combustion process. In short, distinctive differences for western coals result in significantly different mercury conversion mechanisms in the combustion process that present a unique challenge and employment of effective control technologies.

Measurements of total mercury and speciated mercury forms were made before and after the last pollution control device in the plants selected for testing under the ICR. These data provide a good starting point and valuable guidance for an experimental program targeted at developing mercury control technology for western coals. The changes in mercury speciation and removal measured across different pollution control devices have been correlated with fuel properties. Mercury removals were consistently lower for low-chlorine coals and, therefore, for western coals. For example, removals across a cold electrostatic precipitator (ESP) averaged about 35 percent for bituminous coal compared to 10 percent for western low-rank coal (lignite and subbituminous), and removals across a cold ESP followed by wet flue gas desulfurization (FGD) averaged 65 percent for bituminous coal compared to 35 percent for low-rank coal.

The percentage of elemental mercury in the flue gas leaving the furnace and ahead of the pollution control system tended to drop sharply, from over 85 percent to about 10 percent at coal chlorine contents greater than 150 to 200 ppm, which distinguishes western coal from eastern bituminous coal. In general, plants burning coals with low levels of chlorine did not reduce oxidized mercury across particulate control devices, whereas plants burning coals with high levels of chlorine did show some removal of oxidized mercury across particulate control devices. Additionally, fabric filters were the only particulate control devices that appeared to remove any appreciable amount of elemental mercury, but again, significant removal occurs only at coal chlorine contents above 200 ppm.

Both spray dryer absorbers and wet scrubbers remove approximately 90 percent of the oxidized gaseous mercury entering but essentially none of the elemental mercury. Therefore, they can be quite effective for mercury removal overall for high-chlorine coals but ineffective for low-chlorine coals.

In summary, the available experimental and field data indicate that existing pollution control technologies are not effective in controlling the emissions of elemental mercury emitted by low-chlorine western coals.

Mercury Control Options Being Investigated

Currently, the mercury control strategies for western coal-fired power plants involve, first, the enhancement of existing control technologies and, second, the investigation and development of new control technologies. The enhancement strategies include sorbent injection with and without flue gas modifications upstream of an ESP or fabric filter, and mercury oxidation upstream of a wet or dry FGD. The new technologies include mercury capture using the gold-coated materials, baghouse inserts, and carbon beds.

Sorbent injection upstream of an ESP or fabric filter. Many potential mercury sorbents have been evaluated, including carbon-based, calcium-based, and metal-based (i.e., gold, silver, etc.) sorbents. Activated carbon injection is the most promising and mature technology available for mercury control. However, the commercial experience is primarily from application of the technology at waste incinerators where very high chlorine levels are present. The projected annual cost for activated carbon adsorption of mercury in a duct injection system for a coal-fired utility is significant. Carbon-to-mercury weight ratios of 3000 18,000 (lb of carbon injected per lb of mercury in flue gas) have been estimated to achieve 90 percent mercury removal from a coal combustion flue gas containing 10 μg/Nm3 of mercury. Lower-cost

and noncarbon-based sorbents that have less impact on fly ash sales and more effectively designed sorbent injection processes are needed to reduce costs of sorbent injection.

Recently pilot-scale testing of mercury removal efficiencies for activated carbon injection upstream of an ESP only and an ESP baghouse (fabric filter) was conducted for a Fort Union lignite coal. The results, illustrated in Figure 1, for the ESP only were compared to those obtained at full-scale utility boilers, while injecting activated carbons into a bituminous coal combustion flue gas upstream of a ToxiconTM (pulse-jet FF) and into bituminous and Powder River Basin (PRB) subbituminous coal combustion flue gases upstream of an ESP. For the ESP cases, the pilot-scale lignite and utility-scale eastern bituminous coal tests showed mercury removal efficiency increased with increasing activated carbon injection rates. Conversely, mercury removal efficiency was never greater than 70 percent, regardless of the activated carbon injection rate into the PRB subbituminous coal combustion flue gas. This limitation is probably caused by the low amount of acidic flue gas constituents such as chlorides that promote mercury-activated carbon adsorption.

The use of the ESP fabric filter showed good control efficiencies for lignite and bituminous coal because of the longer contact time with the activated carbon sorbents. However, testing conducted at a lignite-fired power plant equipped with a spray dryer baghouse firing Fort Union lignite indicated poor performance of conventional activated carbon injection to control mercury. The results indicate poor control efficiency for two different types of activated carbons. Mercury removal efficiencies were less than 35 percent. The poor results are due to the low chlorine containing flue gas and the high proportion of elemental mercury in the flue gas stream. These results re-emphasize the challenges associated with mercury control for low-rank western coals.

Researchers are striving to attain a more thorough understanding of mercury species reactions on activated carbon surfaces in order to produce more efficient sorbents. Sorbents for elemental mercury control must both oxidize the mercury and provide a binding site.

Figure 1. Pilot-scale ESP and full-scale ToxiconTM (ESP FF) and ESP mercury removal efficiencies as a function of activated carbon injection rate.

Mercury oxidation upstream of wet and dry scrubbers. Mercury oxidation technologies being investigated include catalysts, chemical agents, and cofiring materials. The catalysts that have been tested include selective catalytic reduction (SCR) catalysts for NOx reduction, noble (palladium) metal-impregnated catalysts, and oxide-impregnated catalysts. The chemical agents include chlorine-containing salts and cofiring fuels that contain oxidizing agents.

SCR catalysts have been tested for their ability to oxidize mercury. The ability to oxidize mercury has shown mixed results. Mercury speciation sampling has been conducted upstream and downstream of SCR catalysts at power plants that fire bituminous and subbituminous coals. The results of testing indicate evidence of mercury oxidation across SCR catalysts when firing bituminous coals. However, when firing subbituminous coal, the results indicate limited oxidation. This is based on a limited number of tests, and more testing needs to be conducted on low-rank coals. The ability of SCR systems to contribute to oxidation appears to be coal specific and is related to the chloride, sulfur, and calcium content of the coal as well as temperature, specific operation of the SCR catalyst, and duration of exposure to flue gas. Western coal ash can cause blinding of the SCR catalyst and, therefore, limit the use of SCR for western coals.

Noble metal-impregnated catalysts have shown high potential to oxidize elemental mercury. Results from a slipstream device at a North Dakota power plant indicated that over 80 percent conversion to oxidized mercury is possible for periods of up to 6 months. Additional larger-scale, longer-term tests are still needed to determine if the technology is feasible. Tests were also conducted using iron oxides and chromium, with little success of oxidation.

Fuel additives for mercury oxidation have shown the potential to oxidize mercury. Chemical additives or oxidants such as chlorine-containing salts added to the lignite have shown the ability to convert elemental mercury to more reactive oxidized forms. Recent short-term testing conducted at a full-scale pulverized-coal-fired North Dakota power plant indicated the injection chloride salts resulted in increased mercury oxidation in the flue gas. Mercury oxidation of up to 70 percent was observed at a salt injection rate that resulted in an HCl concentration of 110 ppm in the flue gas. In addition, the injection of salt resulted in enhanced removal of mercury across the spray dryer baghouse with removal efficiencies of up to 50 percent in short-term field testing. Significant operational impacts were observed during the short-duration testing. Pressure drop across the spray dryer baghouse increased with salt addition. Air heater pluggage was observed with some of the salt

compounds. The short tests also do not show the potential long-term impact on corrosion, operations, and waste disposal.

Conclusions

Currently, there is no single best technology that can be applied broadly to control mercury emissions from coal-fired power plants. Combinations of available control methods may be able to provide up to 90 percent control for some plants but not for others, depending upon coal type. Lignite-and subbituminous coal-fired power plants are faced with the most significant challenge because reliable, demonstrated control technologies for highly unreactive elemental mercury are not commercially available. Only limited short-term tests have been performed to date. Significant research, development, and field testing are required to prepare the electric utility sector for implementation of mercury standards.

STATEMENT OF DR. RICHARD BUCHER, W.L. GORE AND ASSOCIATES

Good morning, Chairman Voinovich, Ranking Member Carper and members of the subcommittee. My name is Richard Bucher, and I am here to speak on behalf of W.L. Gore & Associates, Inc. about some exciting technical advances that may offer a solution to the vitally important challenge of reducing mercury emissions.

Gore is a leading company in the field of advanced materials that provide creative solutions to long-standing problems. We believe that a new mercury capture system we have developed, and that has recently been tested at the EPA, may well offer dramatic improvements in the effectiveness, efficiency and cost of mercury capture from flue gas. We are very excited by this development, as an improvement of this kind in mercury control could greatly contribute both to the long-term sustainability of power generation from coal, and to the health of all Americans.

I greatly appreciate the opportunity to testify today. My employer, W.L. Gore & Associates, is best known as the maker of GORE-TEX fabrics. Many of you may own or use GORE-TEX garments for hiking, hunting or running. Gore has been using the same high-performance polymer membrane that makes our fabrics waterproof, windproof and breathable in many other applications for more than 30 years. We manufacture a wide range of electronic, medical and industrial materials and devices. Of main interest to us today is the application of the GORE-TEX membrane, and related membranes, to the field of industrial filtration.

Gore has built a reputation since the 1970's as a leading supplier of high-performance filter bags to the energy industry, cement kilns, chemical and metals production facilities, waste incinerators and other industrial applications. Beginning in the 1990's, Gore scientists and engineers have discovered and developed a series of radical improvements to our bags through embedding additional materials and properties into the structure that makes the bags work. These advances have led to new applications for capturing over 99.99 percent of fine particulate, for catalytically destroying over 99 percent of dioxins and furans, and most recently for capturing over 90 percent of mercury in flue gas streams. The result is a cleaner, safer, healthier environment and more sustainable industry.

Our invention in the area of mercury capture has moved well beyond the lab bench and shows dramatic promise for the future. Our product relies on the same basic technique as the best current technology using activated carbon to capture mercury but in a way that is up to two orders or roughly 100 times more effective—and that has dramatic positive implications for the waste handling and cost features of our solution.

Current technologies to control mercury emissions from coal fired power plants include activated carbon injection, wet scrubber technology, selective catalytic reduction (SCR) technology, combinations of these, as well as a host of other potential options. The United States Environmental Protection Agency's "Mercury Study Report to Congress" from December 1997 presents an exhaustive review of the technological options and their associated financial impact. This report indicates that active carbon injection represents the greatest potential for the lowest cost, most technically feasible solution.

Unfortunately, activated carbon injection has significant drawbacks that make the technology incompatible with some coal fired power facilities and fiscally prohibitive to others. A primary drawback of activated carbon injection is contamination of the facility's fly ash. Not only does the presence of the carbon render the fly ash unsalable, but also the presence of mercury has the potential to require the fly ash to be classified as a hazardous waste and be disposed of accordingly. Additionally, the literature remains inconclusive regarding the ability of activated carbon to consistently control elemental mercury emissions, making this technology potentially

incompatible with many existing facilities burning lignite and Powder River Basin (PRB) coals. Activated carbon injection also requires a coal fired power plant to purchase, store, inject and dispose of a large volume of material. This has the secondary impact of requiring additional footprint and capital expenditures related to the necessary equipment, and also further burdens the particulate capture equipment with additional dust loading and pressure drop. Wet scrubber technology is incapable of controlling elemental mercury emissions, and SCR (selective catalytic reduction) technology is prohibitively expensive when employed solely for mercury control.

The lack of a financially and technically compelling alternative for mercury emissions control from coal fired power plants led W.L. Gore and Associates, Inc. to create a technology project focused on investigating the feasibility of efficiently trapping and immobilizing gaseous mercury compounds from flue-gas streams using a reactive filter system. The progress to date of this work is summarized in this testimony.

Initial work at Gore focused on developing a wide variety of reactive mercury trapping formulations. A bench-top screening experiment was then conducted to identify formulations with the best opportunity for long-term success. To add credibility and confidence to this study,

all testing was performed at the EPA's research facility in Research Triangle Park, North Carolina. The mercury test reactor utilized allowed for control of inlet concentrations of mercury, SO_2, NOx, H20 and O_2. Analysis methods included both continuous mercury monitoring and the widely accepted standard Ontario Hydro test procedure. To accelerate the testing an inlet mercury level of 1 ppm Hg, far in excess of typical coal fired power plant emissions, was selected. To further challenge the samples, testing was conducted at 185 C (365 F), significantly above typical baghouse conditions.

The performance of the highly active samples were then compared with state-of-the-art mercury absorbent technology as reported in the literature. Most comparison materials represented treated and untreated activated carbons. A summary of the data is shown in figure 1, with traditional activated carbon capacities shown in blue (as reported in the literature) and capacities for Gore technology shown in maroon. As illustrated the Gore technology shows a dramatic increase in the adsorption capacity in comparison to conventional materials.

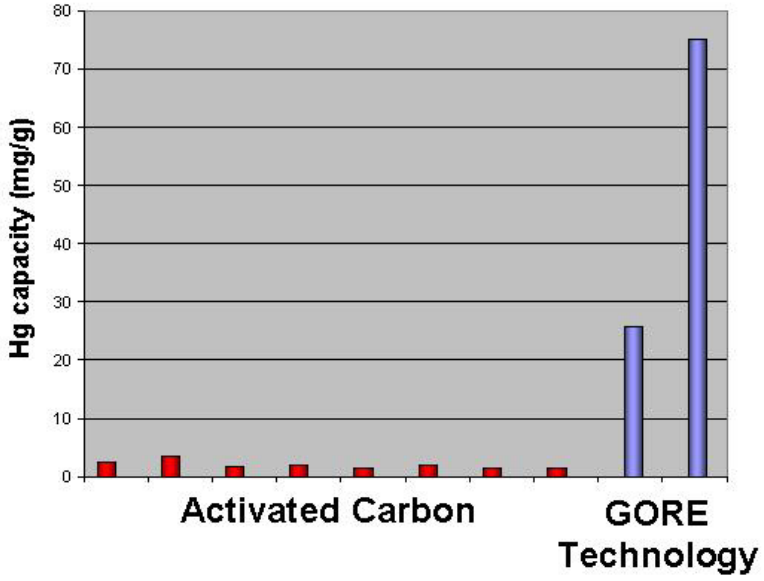


Figure 1: Mercury adsorption capacity comparison of conventional technologies with Gore technology.

The key to our technology lies in this increased capacity to capture and hold mercury. This advance has the potential to allow the coal fired power industry to move

the function of mercury control from a consumable material, as with traditional activated carbon injection, to a system component, such as a filter bag or a filter bag insert. Retrofitting a facility with a fabric filter bag-house already in place can be as easy as dropping mercury trapping inserts into the existing filters, requiring no additional system infrastructure or space. Most significantly this approach does not contaminate the fly ash with mercury-laden activated carbon, allowing facilities to continue to sell, as opposed to landfill, this valuable by-product of the coal fired power industry. Finally, our technology is completely passive in nature. Once installed it is always operating, continuously protecting the air we breathe, and does not require additional operators, maintenance or monitoring.

Full size samples have been produced to test mechanical performance and integrity in a full-scale commercial facility. Figure 2 shows a photograph of a full size Gore-Tex filter bag with a mercury capture insert. Two such prototypes have been installed on a commercial incineration facility and have been successfully operational since November 2002. This test continues to run to demonstrate long term mechanical integrity.

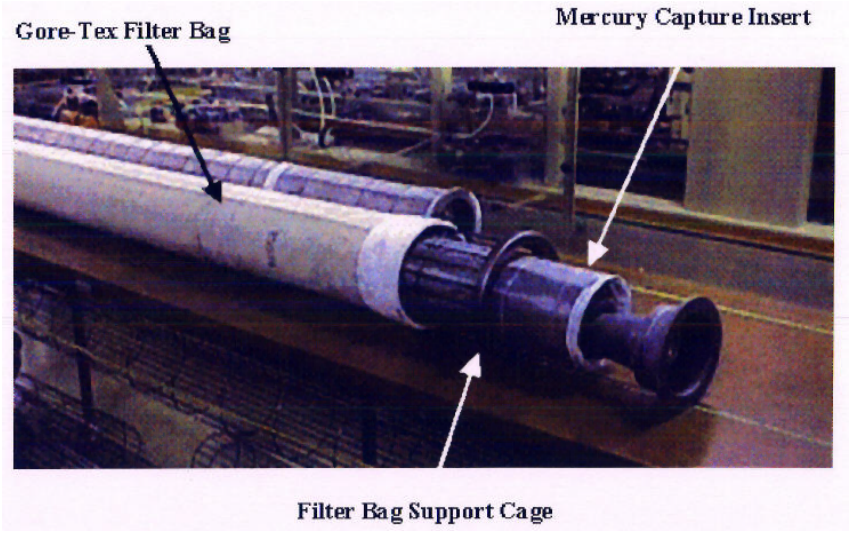


Figure 2: Filter bag, mercury capture insert system.

As indicated, the development of our technology has progressed from the laboratory/bench scale phase to pilot testing. Our most significant testing to date was conducted at the EPA on their pilot scale coal combustion unit. The 7-week trial, with 24-hour operation, was designed to test the long-term viability of the technology under a variety of conditions, burning both Powder River Basin (PRB) coal and Lignite coal. Coal burning trial results, illustrated in Figure 3, indicate mercury capture rates consistently in excess of 90 percent.

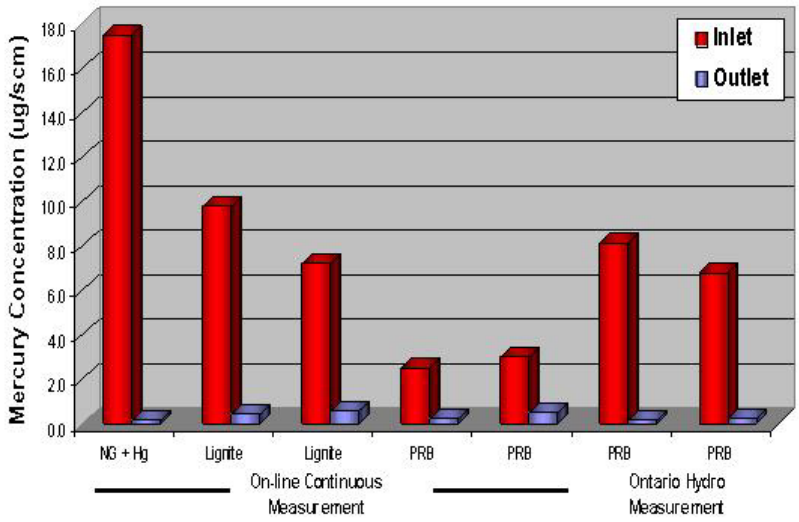


Figure 3: Mercury test results before and after the Gore mercury capture system. Tests conducted with PRB Coal, Lignite Coal and Mercury doped Nature Gas (to simulate high mercury inlet levels)

These results, assuming further successful field verification, would allow coal burning facilities to easily comply with the most stringent regulations set forth in the CLEAR SKIES Act of 2003, and the CLEAN AIR PLANNING Act of 2003, and would even approach the control levels required in the CLEAN POWER Act of 2003.

As a private company serving the air pollution control industry for over 30 years, we at W.L. Gore & Associates clearly realize that even the most advanced technology must provide our customers an economic advantage. Our mercury technology is being designed to provide the benefits stated above, while potentially costing considerably less than activated carbon injection. The EPA research and development report titled "Performance and Cost of Mercury Emission Control Technology Applications on Electric Utility Boilers" identifies carbon injection as the most cost-effective approach available to date for utilities without existing scrubbers and SCR systems. For example activated carbon injection for a 110 MW facility is projected to cost approximately $700,000 per year. When the lost revenue of un-salable fly ash is added, these numbers inflate to a range from $1.1MM to $1.5MM per year. Current estimates indicate our technology could be 38 percent to 83 percent lower than these values, making our approach both easier to implement, and more cost effective.

Although we have not begun marketing this technology to the coal fired power industry, our interactions with prospective customers have been nothing short of extremely encouraging. Owners and operators of our nations coal fired power plants have expressed enthusiastic support for our concept, citing the ease of implementation, minimal impact on system performance, and most of all the preservation of fly ash value which is so critical to their bottom line. Indeed initial support has been so strong that most facilities we've interacted with have eagerly volunteered as locations for future field-testing.

Once again, I appreciate the opportunity to testify before you today regarding the important issue of mercury emissions control. W.L. Gore & Associates remains committed to developing innovative, economically feasible technologies to address our nation's air quality challenges. We look forward to continuing to work with the committee, the EPA and the coal fired power industry to make this technology a commercial reality.

Thank you again for allowing me to testify, and I'm pleased to answer any questions you may have for me.

GORE-TEX is a Registered Trademark of W.L. Gore & Associates, Inc.

STATEMENT OF HON. DENISE NAPPIER, TREASURER, STATE OF CONNECTICUT

Good morning. My name is Denise Nappier, and I am Treasurer of the State of Connecticut. I appear before you as an institutional investor and the principal fiduciary of a $17 billion pension fund representing 160,000 beneficiaries and plan participants. As Treasurer, I am elected by the people of my State, who, like millions of Americans, have sought to ensure their families' economic future through investments in the capital markets.

I appreciate the opportunity to testify today on the relationship between climate change, corporate governance, and the well-being of institutional and individual investors.

I am sure you have heard considerable testimony from others more expert than I am on the science of climate change, so I won't go there. What I will do is give you the perspective of an institutional investor whose responsibility it is to look to the long term value of our pension fund.

You know, we all learned a number of very painful but very valuable lessons from Enron and the corporate scandals that followed, and we must not allow ourselves to lose sight of those lessons. We learned about the disastrous impact on our investment savings, our jobs and our economy. That is when transparency, accountability and an honest assessment of risk are not viewed by companies as priorities, either by design or otherwise.

As institutional and individual investors, we need accurate and complete disclosure of information that could affect the current and future health of the companies we invest in and that goes beyond accounting to include, among other things, climate change as a risk factor.

The consequences for those companies that do not act responsibly today and take steps to assess and mitigate the risk associated with climate change can be quite devastating. For example, companies could face the prospect of losing their competitive edge, incurring litigation costs, or being saddled with unforeseen capital expenses, just to name a few. All of these factors and others can erode shareholder value and place today's seemingly solid investment in jeopardy.

Climate change may well be about our planet's future, but it is also about the financial risks to corporations, and the impact on the retirement savings of millions of Americans. As a result, we have every right to know what is being done about it and how America's corporations will protect their bottom line, and thereby the value of our investments.

I believe that this issue is quickly becoming the leading edge of the next wave of corporate governance issues, and that the market place must begin to closely scrutinize companies to determine whether they have honestly, directly and thoroughly evaluated climate change as a risk factor and developed a proper response to it.

You know, in finance, where there is risk, there can also be reward. A report by the Rose Foundation last year, "The Environmental Fiduciary", reviewed the findings of a number of studies on this issue, and concluded that "in many cases improving environmental performance provides a measurable boost to profitability and shareholder value, especially over the long term."

So, we have a real opportunity here to not only protect our shareholder value, but also to achieve added value.

While you in Congress are debating the merits of a legislative response to climate change, such as whether or not to enact mandatory caps on carbon emissions, other nations are preparing to implement the provisions of the Kyoto Protocol which include mandatory provisions. Many of the companies in which we invest particularly companies such as GE, ExxonMobil, and Daimler Chrysler operate in a global economy. For them, carbon regulation is not a future possibility, it is an imminent reality. And many State governments are also considering, and enacting, legislation addressing climate change.

Beyond the regulatory environment, shareholders are now advancing this issue. This year, resolutions on climate change were introduced at 23 U.S. companies and the Connecticut pension funds filed two of these and co-filed on a third.

Shareholders are asking companies to report on their greenhouse gas emissions, or to set a goal to reduce emissions, or to report on the potential future financial risk to the company from their past, present, and future emissions and to issue a plan to mitigate that risk.

Some of these resolutions were withdrawn after productive discussions between shareholders and management. Most of the resolutions, however, were opposed by management and the directors. That opposition may prove to be shortsighted penny wise and pound-foolish.

At the annual shareholder meeting of American Electric Power held this past April, the climate change resolution sponsored by Connecticut received the support of 27 percent of shareholders voting. While some people may say 27 percent is not a majority, I believe this vote is both extraordinary and virtually unprecedented. And I should add that an article in the Wall Street Journal the next day shared that view.

In fact, the percentage of shares voted in support of climate change resolutions has doubled in the last 2 years, according to data from the Investor Responsibility Research Center. Make no mistake, there is significant investor concern about the impact that climate change could have on our nation's economy.

In addition to the shareholder resolutions, other efforts to encourage disclosure of potential risk are underway:

- Connecticut is a signatory of the Carbon Disclosure Project which surveyed the 500 largest companies in the world, and found that while 80 percent acknowledge the importance of climate change as a financial risk, only about 40 percent were actually taking action to address the risks and opportunities.
- We also participated in a year-long dialog sponsored by the Coalition for Environmentally Responsible Economies (CERES), which brought together investors, environmental activists and electric power companies to discuss the potential financial impact of climate change and efforts to mitigate its effects. That final report is to be issued shortly.
- We have joined other investors in urging the Securities and Exchange Commission to insist on more comprehensive disclosure of climate risk.
- And I have begun organizing an Institutional Investor Summit which will be held this fall in New York City to discuss these issues and set an agenda for action to protect the long-term value of our investments.

In conclusion, to look at climate change only as an environmental issue misses the point. Climate change is an investor security issue of the highest magnitude, and the work of corporations, legislators, regulators, and investors is intertwined and interdependent. That's why it is so important that we work together to protect the long-term value of our investments, as well as our economic well-being.

I appreciate the opportunity to share my views with you today, and stand ready to work with you in the future. Thank you very much.

STATEMENT OF DR. MARGOT THORNING, CHIEF ECONOMIST, AMERICAN COUNCIL FOR CAPITAL FORMATION

Executive Summary

U.S. economy. The reason that the Bush Administration rejected the Kyoto Protocol approach to addressing climate change was that they had analyzed the costs of sharp, near term emission reductions and found that the economic costs were significant and the benefits(in terms of reduced global concentrations of CO2) were negligible. A range of credible macroeconomic models showed that reducing U.S. CO2 emissions to the Kyoto Protocol level(7 percent below 1990 levels by 2010) would reduce U.S. GDP by 2 to almost 4 percent annually.

Impact of Clear Skies Act of 2003 (S. 485) on the Financial Health of the Utility Sector. Most observers conclude that pollution reduction targets in S. 485 will be a challenge for utilities and add billions of dollars to utilities costs. Nonetheless, some in the industry believe that the Clear Skies goals are achievable and can be reached without sharp impacts on electricity prices or on the financial viability of the industry. Providing certainty to investors for the next decade and a half as to the targets for the three pollutants is, in this instance , likely to reduce the risk and the cost of capital for utility investors.

Impact of Carbon Emission Emission Targets on the U.S. Utility Sector. Proponents of carbon emission caps for the utility sector argue that eventually the U.S. will decide to impose carbon caps and that utilities would feel that "safer" about investing if they were told now what the carbon reduction target would be. The argument has several weaknesses. First, imposing carbon caps such as those proposed by Senator Jeffords, which requires a reduction in CO2 in the range of the cut required by the Kyoto Protocol would be just the first step in a series of ever more severe emission reductions. Second, unlike their competitors in the EU, U.S. firms would be compelled to meet the emission caps mandated by government legislation. Thus, European companies are not generally threatened with harsh legal penalties as are U.S. firms when targets are missed. Third, carbon caps will increase the price of electricity. As U.S. economic growth slows in response to higher electricity prices, demand for electricity falls and profits decline. Thus, by weakening demand for the

product (electricity) carbon caps will increase the the risk and uncertainty of investment in utilities.

A Positive Step to Reducing the Risk and Increasing Certainty for Utility Investment. Many experts conclude that the depreciation allowances provided for utility investments under the Federal tax code are out of date. Now that utility markets are becoming increasingly deregulated, investors have no assurance that their investment will actually pay off. Thus, shorter capital cost recovery periods could materially reduce the risk of investment because the payback period would be shorter.

Climate is a Global Issue, Requiring a Global Perspective. Any threat of climate change associated with greenhouse gas emissions is linked to global emissions, not emissions in any one country or one industry. And given that emissions in developing countries like China and India are projected to account for 84 percent of the increase in global emissions between 1990 and 2010, any climate policy that does not address developing country emissions is doomed to failure.

Introduction

My name is Margo Thorning and I am pleased to present this testimony to the Senate Environment and Public Works Committee, Subcommittee on Clean Air, Climate Change, and Nuclear Safety.

The American Council for Capital Formation represents a broad cross-section of the American business community, including the manufacturing and financial sectors, Fortune 500 companies and smaller firms, investors, and associations from all sectors of the economy. Our distinguished board of directors includes cabinet members of prior Republican and Democratic administrations, former Members of Congress, prominent business leaders, and public finance and environmental policy experts.

The ACCF is now celebrating its 30th year of leadership in advocating tax, regulatory, environmental, and trade policies to increase U.S. economic growth and environmental quality.

We commend Chairman Voinovich and his committee for their focus on positive changes to the Clean Air Act as contained in the Bush Administration's Clear Skies proposal. The Clear Skies proposal calls for reductions in SO2, nitrous oxides (NOx), and mercury, but does not regulate CO2 emissions. The focus of my testimony will be on the potential impact of the Clear Skies Act of 2003 and proposals to cap power plant carbon emissions, such as those put forward by Senator Jeffords, on the financial health and vitality of the utility sector. Other proposals include caps on emissions for other sectors of the economy.

Impact of Carbon Caps on the U.S. economy

The reason that the Bush Administration rejected the Kyoto Protocol approach to addressing climate change was that they had analyzed the costs of sharp, near term emission reductions and found that the economic costs were significant and the benefits(in terms of reduced global concentrations of CO2) were negligible. A range of credible macroeconomic models showed that reducing U.S. CO2 emissions to the Kyoto Protocol level(7 percent below 1990 levels by 2010) would reduce U.S. GDP by 2 to almost 4 percent annually.

The models on which the Administration relied showed that as carbon emissions are capped or constrained, economic growth slows due to lost output as new energy taxes are imposed and prices rise for carbon-intensive goods, which must be produced using less carbon and more expensive production processes. In addition, the capital stock accumulates more slowly reflecting the premature obsolescence of capital equipment due to the sharp energy price increases required to meet a target of reducing emissions to 93 percent of l990 levels by 2010.

Instead, the Administration has chosen a different strategy, one based on accelerating the downward trend in U.S. greenhouse gas (GHG) emission intensity. The goal of reducing economy wide GHG intensity per dollar of GDP by 18 percent over the next decade(compared to a 14 percent reduction under the baseline) will allow continued economic growth while encouraging a slowing of the rate of growth of CO2 emissions. This alternative approach does, however, require a major commitment to incentives for deploying new technology, a long term research and development program for carbon sequestration, alternative energy sources for electricity generation, transportation and energy conservation.

Given the quality and quantity of empirical research by demonstrating that near term targets and timetables for CO2 emission reductions will cost U.S. jobs, economic growth and competitiveness (see www.accf.org for testimony before the Senate Governmental Affairs Committee in June, 2001 for more details), it seems unwise to propose hobbling the U.S. utility sector with the same type of regime which the U.S. Senate rejected by a vote of 95 to 0 in l997 for the U.S. economy as a

whole. Impact of Clear Skies Act of 2003 (S. 485) on the Financial Health of the Utility Sector.

The focus of the Committees' hearing today is to assess the effects of S. 485, the "Clear Skies Act of 2003" on the ability of the utility sector reduce pollution from SO2, NO2 and mercury and meet the expected growth in demand for electricity as well. Most observers conclude that pollution reduction targets in S. 485 will be a challenge for utilities and add billions of dollars to utilities costs. Nonetheless, some in the industry believe that the Clear Skies goals are achievable and can be reached without sharp impacts on electricity prices or on the financial viability of the industry. Providing certainty to investors for the next decade and a half as to the targets for the three pollutants is, in this instance, likely to reduce the risk and the cost of capital for utility investors.

Impact of Carbon Emission Emission Targets on the U.S. Utility Sector

Proponents of carbon emission caps for the utility sector argue that eventually the U.S. will decide to impose carbon caps and that utilities would feel that "safer" about investing if they were told now what the carbon reduction target would be. The argument has several weaknesses.

First, imposing carbon caps such as those proposed by Senator Jeffords, which requires a reduction in CO2 in the range of the cut required by the Kyoto Protocol would be just the first step in a series of ever more severe emission reductions (see Figure 1). This agenda was clearly understood by the architects of Kyoto in 1997. For example, Tim Wirth, the former Clinton Administration climate policy negotiator, testified in 1997 that carbon emissions had to be cut by up 10 times the Kyoto target (a 70 percent reduction). The UK has recently announced a target of a 60 perecent reduction by 2050. Adopting a proposal such as S. 366, which requires cuts almost as large as the Kyoto Protocol would increase the pressure on the U.S. from the European Union to adopt the EU's next emission reduction target for the second commitment period. The EU is expected to push for a 60 percent reduction from 1990 emission levels by the year 2050 at the COP 9 meeting later this year in Italy. Thus, even if the U.S. imposes a carbon cap like that in S. 366, there can be no certainty those caps will hold in the future and that the goal posts will not be moved back in response to pressure from the EU.

Second, unlike their competitors in the EU, U.S. firms would be compelled to meet the emission caps mandated by government legislation. In contrast, the relationship between the regulators and the regulated is different for industry in the EU; there is more accommodation and willingness to let targets slip if they are not achieved. Thus, European companies are not generally threatened with harsh legal penalties as are U.S. firms when targets are missed. In addition, the European Union's own projections indicate that the EU is not likely to meet its first GHG emissions reduction target.

Third, carbon caps will increase the price of electricity. As U.S. economic growth slows in response to higher electricity prices, demand for electricity falls and profits decline. As utilities attempt to switch from coal to natural gas to reduce CO2 emissions, gas prices rise which in turn raises the cost of feedstocks to the chemical and fertilizer industries and fuel to other industrial sectors. As previous research has demonstrated, carbon caps will make it harder for U.S. manufacturing to keep its operations at home and will increase the attractiveness of locating in areas like China with low cost labor and no carbon emission caps. Thus, by weakening demand for the product (electricity) carbon caps will increase the the risk and uncertainty of investment in utilities.

A Positive Step to Reducing the Risk and Increasing Certainty for Utility Investment

Many experts conclude that the depreciation allowances provided for utility investments under the Federal tax code are out of date. Now that utility markets are becoming increasingly deregulated, investors have no assurance that their investment will actually pay off. Thus, shorter capital cost recovery periods could materially reduce the risk of investment because the payback period would be shorter. A U.S. Department of the Treasury report to Congress released in 2000 noted that the current class lives for utilities may no longer be appropriate because of increased competitiveness in the industry.

If the United States is to meet the challenges of maintaining strong productivity growth, then new investment in all types of assets, including energy supply, will be required. For example, investorowned utilities estimate needed capital expenditures of almost $90 billion over the 2001–03 period. A study commissioned by the ACCF Center for Policy Research shows that the United States ranks in the bottom third or below in terms of capital cost recovery allowances for transmission and generation of electricity, as well as investments in pollution control (see Figure 2 and

Table 1). For example, after 5 years, a U.S. company recovers only 29 percent of its investment in a combined heat and power generation facility compared to 51 percent in Germany, 53 percent in Japan, 100 percent in the Netherlands, and 105 percent in China. Thus, investment costs are recovered much more quickly in these and other countries with which the United States competes or where U.S. business might choose to locate or expand manufacturing operations. (See previous ACCF testimony at www.accf.org for additional international comparisons.)

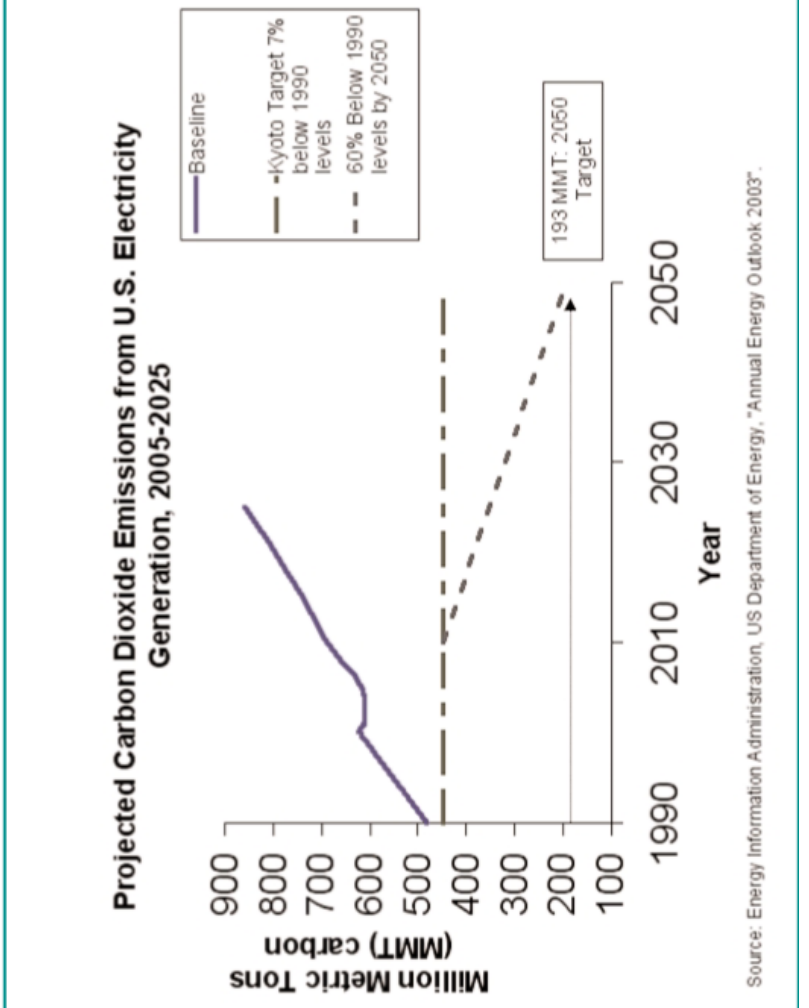
Corporate tax rates are also high in the United States relative to our competitors, and this tendency is worsening. The average top corporate income tax rate in the European Union has dropped from 34.4 percent in 1995 to 31.7 percent in 2001; the top U.S. corporate income tax rate was 35 percent in 1995 and remains at that level today.

Climate is a Global Issue, Requiring a Global Perspective

Any threat of climate change associated with greenhouse gas emissions is linked to global emissions, not emissions in any one country or one industry. And given that emissions in developing countries like China and India are projected to account for 84 percent of the increase in global emissions between 1990 and 2010, any climate policy that does not address developing country emissions is doomed to failure. Promoting a voluntary, economy-linked goal for developing countries encourages their participation in a global effort without threatening their goal of improving living standards for their citizens.

Pro-growth tax changes, including faster depreciation and enhanced tax credits combined with regulatory reform could strengthen the U.S. economy and reduce emissions intensity.

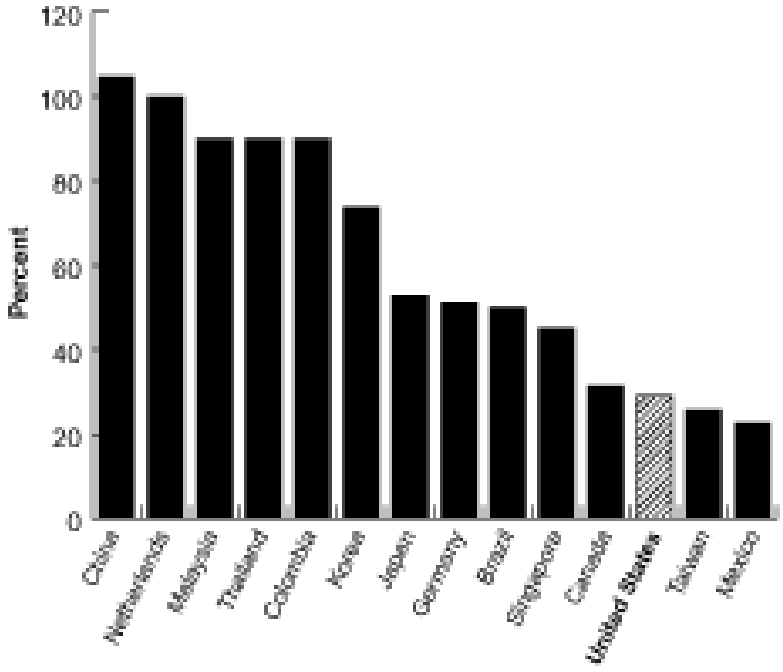
Figure 1



Source: Energy Information Administration, US Department of Energy, "Annual Energy Outlook 2003".

Figure 2 International Comparison of Nominal Capital Cost Recovered After Five Years for Combined Heat and Power Facilities

Percent of total investment expenditure



Note: The data above show the cumulative amount of capital cost recovery deductions from taxable income allowed under each country's tax code after five years.

Source: Data from Arthur Andersen LLP, Washington, D.C.

Table 1 International Comparison of Nominal Capital Costs Recovered After Five Years for Energy Investments and Pollution Control Equipment
Percent of total investment expenditure

	Electric Generating Plants			Electric Transmission & Distribution Lines	Combined Heat & Power Generation Facilities Using Conventional Fuel (assumes power for sale)	Distribution of Industrial Steam & Electricity Generated for Self-Use	Pollution Control Equipment [2]	
	Gas[1]	Coal	Nuclear				Input Modification (e.g., scrubbers)	Discharge Modification (e.g., thermal discharge control)
United States	**37.7%**	**29.1%**	**37.7%**	**29.1%**	**29.1%**	**37.7%**	**65.8%**	**65.8%**
Brazil	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Canada	31.2%	31.2%	31.2%	16.8%	31.2%	16.8%	35.5%	35.5%
China	**52.4%**	**52.4%**	**52.4%**	**104.7%**	**104.7%**	**104.7%**	**104.7%**	**104.7%**
Colombia	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	100.0%	100.0%
Germany	**41.0%**	**41.0%**	**34.1%**	**34.1%**	**51.1%**	**41.0%**	**56.6%**	**56.6%**
Japan	**48.4%**	**48.4%**	**48.4%**	**31.9%**	**52.7%**	**88.3%**	**80.1%**	**80.1%**
Korea	26.0%	26.0%	26.0%	73.8%	73.8%	73.8%	44.5%	44.5%
Malaysia	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	100.0%	100.0%
Mexico	22.5%	22.5%	22.5%	22.5%	22.5%	22.5%	100.0%	100.0%
The Netherlands	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Singapore [3]	45.0%	DNA	DNA	45.0%	45.0%	45.0%	70.0%	70.0%
Thailand	91.0%	91.0%	91.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Taiwan	24.4%	24.4%	24.4%	34.3%	25.7%	34.3%	100.0%	100.0%

Notes:
The data above show the cumulative amount of capital cost recovery deductions from taxable income allowed under each country's tax code after five years.
1) The United States depreciation for electric generating plants is for gas turbine facilities. However, gas turbines operated in a combined cycle with a conventional steam unit are depreciated like coal facilities.
2) The United States number for pollution control equipment is for pollution control equipment placed in service on July 1 of a year at a coal or combined heat and power facility placed in service before January 1, 1976. The percentage for pollution control placed in service on July 1 of a year at a gas or nuclear facility placed in service before January 1, 1976 is 78.2%. Pollution control facilities at facilities placed in service on January 1, 1976 or later are depreciated on the same basis as the rest of the facility.
3) There are no coal or nuclear power plants operating in Singapore.

Source: Data from Howard A. Cooper, Thelen Reid & Priest LLP, and Arthur Andersen LLP, Washington, D.C., updated December 18, 2001.

STATEMENT OF WES TAYLOR, PRESIDENT, PRODUCTION, TXU ENERGY

Introduction and Background

Mr. Chairman and members of the subcommittee, I am privileged to appear today on behalf of TXU and participate in this subcommittee's ongoing review of S. 485, the Clear Skies Act. I applaud the comprehensive nature of the subcommittee's hearing process for S. 485, and I hope that you will find my statement today on electric generator capital investment decisions helpful during your continued deliberations.

TXU supports President Bush's efforts to reduce SO_2, NOx and mercury emissions through a three pollutant framework such as that used in the Clear Skies Act. However, if the Clear Skies Act is to avoid harmful fuel switching, the Clear Skies legislation must base Phase I mercury limits on "co-benefits" (i.e., that level of mercury emission reduction that results from meeting SO_2 and NOx emission limitations) and should not mandate controls on carbon emissions. Only under these conditions can the Clear Skies Act meet the goal of promoting long-term planning certainty for the electric generator sector and achieving significant reductions in emissions of NOx, SO_2 and mercury.

My statement today will first discuss the general approach used by TXU and other electric generators to analyze capital investment decisions relating to emission control equipment. Typically, this approach includes identification of all potential compliance options, including shutting down power plants and switching fuels, and an extensive long-term cost/benefit analysis for each compliance option.

The second part of my statement will focus specifically on TXU's selection of the SO_2 and NOx controls necessary to meet current State and Federal emissions requirements. It has been critical that TXU accurately estimate both the cost and effectiveness of the available control technologies. Notably, TXU's efforts to significantly reduce NOx and SO_2 emissions as required by Texas law and the Texas State Implementation Plan under the Clean Air Act have been extraordinarily successful, resulting in early compliance with all applicable mandates in 2003.

Finally, my statement will address the capital investment analysis that would be employed by TXU to evaluate the emission reductions proposed in the Clear Skies Act legislation, where mercury controls are expected to be the key planning issue. Currently, there is no commercially demonstrated control technology for mercury and the technologies used in pilot projects have achieved inconsistent results at ex-

treme expense, especially for lignite. Because meeting the Clear Skies Act SO_2 and NOx limits will require significant capital investment by electric generators, adding a requirement for unproven and expensive mercury control technology could result in very costly fuel switching by coal-fired plants. Fuel switching would contribute to price spikes in the natural gas market that would impact not only the electric generator sector, but also consumers and many industries that use natural gas as a raw material or feedstock. The Phase I mercury emission reduction contained in the bill needs to be set at the SO_2 and NOx "co-benefits" level, which is not expected to result in significant fuel switching by electricity generators.

Even if the Phase I mercury emission reduction contained in the bill is revised and set at the SO_2 and NOx "co-benefits" level, meeting the Phase II mercury level of 15 tons in the year 2018 is wholly a bet on future technology. Such uncertainty presents significant investment capital planning problems for electric generators, and may very well overwhelm an electric generator's capital investment analysis for the Phase I SO_2 and NOx limits. Moreover, the mercury emission controls would not significantly reduce global loading of mercury—the Environmental Protection Agency has stated that U.S. electric generators comprise less than 1 percent of the global mercury emissions.

General Approach To Capital Investment Decisionmaking For Emission Controls

By way of background, TXU is a major energy company with operations in North America and Australia. TXU manages a diverse energy portfolio with a strategic mix of over $30 billion of assets.

In its primary market of Texas, TXU's portfolio includes 19,000 megawatts of generation with a fuel mix of coal/lignite, natural gas/oil, nuclear power and wind. TXU serves five million customers in North America and Australia, including 2.7 million competitive electric customers in Texas where it is the leading energy retailer.

TXU's commitment to environmental excellence is well-demonstrated. The Company is one of the nation's largest coal/lignite generators, yet TXU's SO_2 emission rate in 2001 was 21 percent below the national average (52 electric generation companies had higher SO_2 emission rates than TXU in 2000). Similarly, while TXU is the 8th-largest generator of electricity in the Nation, the Company's NOx emission rate in 2001 was 18 percent below the national average (61 electric generation companies had higher NOx emission rates than TXU in 2000). Additionally, TXU's CO_2 emission rate in 2001 was 8 percent below the national average and TXU has implemented the largest voluntary greenhouse gas reduction program among all the investor-owned electric generation companies in the United States.

The first step in an electric generator's capital investment analysis for emission controls is to identify all viable alternate investment scenarios for compliance with a new emissions standard. During this step of the investment analysis, the alternate investment scenarios can range from:

- Attempting a smaller level of capital investment for emissions control technologies at a power plant—but typically a smaller investment in control technologies results in a significant loss of electricity production capacity at the power plant;
- Committing to significant levels of capital investment for emissions control technologies in order to achieve the least possible loss of electricity production capacity at the plant;
- Fuel switching at a power plant; or
- Closing down a power plant, losing all the generating capacity at that power plant but avoiding new capital investment.

Next, the company will calculate the total economic cost of each alternative over the lifetime of the power plant, taking into account any income associated with each alternative. This is a detailed net present-value analysis that, among other things, requires accurate information on the operational costs of a particular control technology and its performance in reducing emissions over the remaining life of each power plant. Specifically, this long-term economic cost analysis of each alternate investment scenario will focus on:

- The amount of capital investment needed up-front and known to be needed in the future;
- The operating expenses associated with the current capital investment and known future capital investment;
- The overall operating expenses of a power plant under the alternative investment scenario (this might include the purchase of emissions credits);
- Whether the alternative investment scenario has operating restrictions that would reduce the production of electricity (and thus reduce income);
- The potential income, if any, from the alternative investment scenario (this might include the sales of emissions credits or byproducts generated by the emissions control equipment).

Armed with the net present value figures, and the pro-forma financial statements related to the net present values, the company will evaluate the financial impacts of each alternate investment scenario against any potential financial constraints faced by the company, such as borrowing limits, debt covenants, or limits on financial ratios. From this process, the company will select a viable alternative investment scenario with the highest overall economic value.

Capital Investment Decisions Relating To Existing SO_2 and NOx Requirements

It may be helpful to review briefly TXU's capital investment decisionmaking process for SO_2 requirements under the Clean Air Act's acid rain program, and for NOx reductions required under Texas State law. Both of these capital investment decisionmaking processes used the general framework discussed earlier, but each also had unique factors that shaped the analysis. Critical to both types of evaluation, however, was the availability of accurate information on the costs and effectiveness of the available options for emissions control equipment.

For example, under the Federal acid rain program, SO_2 reductions were achieved by a two-phased national cap without additional mandatory plant-by-plant restrictions. Accordingly, TXU and other affected electric generators could assess decisions over their entire fleet of power plants, choosing investments and controlling those plants where emissions reductions made the most economic sense. For its capital investment analysis, TXU developed alternate investment scenarios using options available throughout its entire portfolio of lignite/coal fueled units while maintaining compliance with local SO_2 emissions limits.

The primary control technology used to achieve significant reduction of SO_2 emissions is called a "scrubber." To a lesser extent, fuel switching to a low sulfur subbituminous coal can also reduce SO_2 emissions. In its analysis of SO_2 control equipment investment options, TXU found a wide, plant-by-plant variation in the cost of scrubbers, mainly due to different plant designs. Variations in cost were dependent on factors such as existing control equipment and available space in the plant configuration for installation of a new scrubber. In certain instances, elaborate plant modifications would be required to withstand the impact of increased scrubbing. Installation deadlines also significantly impact the cost of installation. Other key drivers in TXU's analysis were the operating costs of the scrubbers, and whether the scrubbers could be expected to perform at planned removal rates for the life of the facility.

TXU's decisionmaking process for compliance with the acid rain program was enhanced by our knowledge of well-tested scrubber technology, coupled with accurate information on the annual operational costs for such equipment. Using this information, TXU could develop precise alternate investment scenarios and compare the scenarios to other compliance strategies, such as purchase of emission credits in the open market.

There are nine coal-fired units in the TXU fleet, five of which are scrubbed, accounting for 61 percent of our coal-fired generation. The cost estimate for installing scrubbers at the four remaining coal-fired units is approximately $400 million.

In contrast to TXU's experience with the acid rain program, the NOx controls required to meet Texas' State NOx limits involved a much more complex analysis of alternate investment scenarios. Under a Texas State law adopted in 1999, electric generators in Texas were required by May, 2003 to achieve a 50 percent reduction in NOx emissions from certain of its plants, as compared to 1997 emissions. TXU and other generators also faced deadlines for achieving other NOx reduction targets in various Texas regions to meet the State Implementation Plan requirements under the Clean Air Act. Additionally, TXU was required to achieve a 25 percent reduction in SO_2 emissions from certain of its plants. TXU achieved all those NOx and SO_2 reductions, plus more, ahead of schedule. Accordingly, TXU's experience in developing a capital investment plan to meet the Texas NOx limits may be instructive as to what electric generators would face under the Clear Skies Act.

Generally, two factors increased the complexity of TXU's capital investment analysis relating to the Texas NOx requirements:

- First, in contrast to the SO_2 scrubber analysis, there were many different NOx technologies that could potentially achieve reductions at each power plant. This probably holds true for the NOx emission limitations contained in the Clear Skies Act as well.
- Second, rather than fleet-wide emission limit (as in the SO_2 example), TXU was required to comply with no less than five different localized or regional NOx limits for its power plants.

This increase in the number of variables complicated the alternative investment analysis. Additionally, localized and multiple regional NOx limits degrade the mar-

ket for NOx emission allowances, reducing the ability of the NOx emission allowance market to reduce overall compliance costs.

TXU will spend approximately $230 million to complete the NOx retrofits required in order to comply with State regulations, through 2005.

Although somewhat more complicated than the SO_2 acid rain program alternative investment analysis, the analysis of TXU's NOx alternative investment scenarios was again aided by our knowledge of well-tested, proven removal technologies and accurate information on the annual operational costs for such equipment. Under the Federal acid rain program and the Texas State NOx limits, TXU has committed hundreds of millions of dollars for capital investment in control technologies. However, the company made that commitment after an extensive economic analysis, with relative certainty of the reductions it expected to achieve.

Potential Additional Capital Investment Under The Clear Skies Act

TXU supports a three pollutant framework such as that used in the Clear Skies Act. However, if the Clear Skies Act is to avoid harmful fuel-switching, the Clear Skies legislation should not mandate controls on carbon emissions and must base Phase I mercury limits on "co-benefits" (i.e., that level of mercury emission reduction that results from meeting SO_2 and NOx emission limitations). Only under these conditions can the Clear Skies Act meet the goal of promoting long-term planning certainty for the electric generator sector and achieving significant reductions in emissions of NOx, SO_2 and mercury.

As introduced, the Clear Skies Act contains the following schedule for reductions in SO_2, NOx and mercury emissions:

The Clear Skies Act contains major reductions in SO_2 and NOx emissions when compared to today's emission levels. Achieving these reductions will require an unprecedented number of state-of-the-art emission controls. With the significantly increased number of emission controls being installed, an electric generator's capital investment analysis must now also include dealing with limitations on the amount of emission control equipment that can be installed at any one time, based on system reliability requirements for the availability of power plants, as well as the shortage of trained professionals that perform such installations and the manufacturing capability to handle a major surge in orders for emission reduction equipment.

Appropriately, the Clear Skies Act does not regulate carbon emissions. Carbon is not a regulated pollutant under the Clean Air Act, nor should it be. Presently, carbon reductions are costly and complex. Given these circumstances, TXU supports the voluntary carbon reduction goals established by the President, as well as funding additional research concerning carbon emission reduction technologies.

However, the mercury provisions of the Clear Skies Act legislation may cause fuel switching by electric generators in order to meet emissions limits. Currently, there is no commercially demonstrated control technology for mercury. Several pilot tests have used activated carbon injection technology, but much remains unknown with that technology and it appears to be prohibitively expensive.

Accordingly, the Environmental Protection Agency's initial position was that the Clear Skies Phase I mercury limit of 26 tons in 2010 would not require a power plant to install mercury-specific emissions controls—the Phase I mercury limit could instead be met solely by the amount of mercury removed as a "co-benefit" of the SO_2 and NOx emission controls installed under the Clear Skies Act. There is now considerable doubt as to whether the Phase I mercury limit can be met through such "co-benefits". If the Phase I mercury limit cannot be met by "co-benefits", power plants must in the near term install unproven and expensive mercury-specific emission control technology, or fuel switch.

Given the already significant capital investment required of electric generators to meet the Clear Skies Act SO_2 and NOx limits, the Phase I mercury emission reduction required by the bill should be revised and set at the SO_2 and NOx "co-benefits" level, as was initially suggested by the Administration. It is important to remember that, even if the Clear Skies Act Phase I mercury level is revised and set at the SO_2 and NOx "co-benefits" level, meeting the Phase II mercury limit of 15 tons in the year 2018 is a bet on future technology.

The lignite coal used by TXU and other electric generators faces additional hurdles with regard to mercury removal. The mercury content of lignite is higher than that of bituminous or subbituminous coal. In addition, the combination of mercury and other constituents in lignite coal is believed to be more difficult to remove using the pilot-tested activated carbon injection technology. The lack of a demonstrated emissions control technology could result in fuel switching for lignite-powered plants, if not plant closings.

This high level of uncertainty with regard to mercury emissions reductions from lignite-powered coal plants requires that TXU factor its approach for compliance with the 2018 Phase II mercury levels into the planning and decisionmaking process for the Phase I SO_2 and NOx levels. That result occurs because TXU's different compliance options for Phase I (for example, continued use of lignite with scrubbers or, alternatively, fuel-switching for the SO_2 limit) may have very different implications for meeting the Phase II mercury levels. This decision tree is outlined at Figure 1.

In summary, the lack of a demonstrated emissions control technology for mercury prevents accurate long-term planning by the electric generating sector. Companies have no idea of the long-term costs associated with mercury removal technology or the effectiveness of the technology once it is installed. This situation is in sharp contrast to the SO_2 and NOx analysis discussed earlier, and significantly complicates the capital investment analysis.

Conclusion

TXU supports President Bush's efforts to reduce SO_2, NOx and mercury emissions through a three pollutant framework such as that used in the Clear Skies Act. However, if the Clear Skies Act is to avoid harmful fuel switching, the Clear Skies legislation must base Phase I mercury limits on SO_2 and NOx "co-benefits" and should not mandate controls on carbon emissions. The Phase II mercury limits beyond "co-benefits" need to be predicated on the existence of a viable, commercially available mercury emission control technology. Only under these conditions can the Clear Skies Act meet the goal of promoting long-term planning certainty for the electric generator sector and achieving significant reductions in emissions of NOx, SO_2 and mercury.

STATEMENT OF JIM MCGINNIS, MANAGING DIRECTOR, MORGAN STANLEY

Introduction

Good morning. My name is Jim McGinnis, and I am a Managing Director in Morgan Stanley's Investment Banking Division, with responsibilities in providing advice on capital raising, restructuring and mergers and acquisitions involving companies in the energy sector. I have focused my work on power and energy providers, utilities and unregulated competitors alike, through a 15-year period characterized by nearly continuous, and episodically chaotic structural change in the sector.

My comments today will address certain of the potential effects on capital formation in the power industry which we expect from the enactment of multi-emissions technology legislation. In particular, I will focus my remarks on the need for and benefits of clarity in the context of a major capital expenditure program such as the one this legislation envisions. Also, I will discuss a few indicators of the economic health of the industry at this time, one characterized by companies seeking to repair balance sheets and regain investor confidence following a tumultuous period in the sector

My predecessors, colleagues and I at Morgan Stanley have been very active in raising new capital on behalf of companies in this industry since the Firm's formation some seven decades ago, through sharply different market environments and economic cycles.

I believe that we institutionally understand the challenges faced by our industry clients today in competing for investor capital through new issues and consistently providing a competitive return on such capital to ensure access to capital for future projects. But today, just as in past decades, providing access to capital on reasonable terms to this industry is not just a business niche; it is a critical underpinning of a healthy national economy.

The utility industry is a reasonably large user of domestic investor capital, with over $800 billion of institutional and individual investment dollars deployed in the nation's power and gas utility and generation sectors. Yet, despite that large number, investor sensitivities to cash-flows, requirements for debt repayments or significant new capital spending can sharply affect any individual company's access to capital. An event-related swell of concern in the market can, and has in the past 12 months, effectively cutoff capital access for even financially sizable companies for significant periods of time.

Interruptions or limitations on capital access in our industry sector can have far-reaching impacts—impacts as gradual and relentless as forcing power-intensive industries to relocate facilities elsewhere in search of cheaper power; or as immediate and dramatic as rolling blackouts in times of supply crisis.

The Need for Clarity

Our focus on multi-emissions legislation today is a particularly important dimension of this continuous provision of access to capital. I believe the various sets of actors in the industry its senior management, workforces, local regulators, employees, customers and investors generally recognize and accept the impending, reasonably sized investment in emissions control technologies as a necessary and useful expenditure.

Indeed, we can observe that some such impending expenditures are expected by the market a fact made evident by the market's neutral-to-slightly positive response to Dominion Resources' recent announcement, made April 18th, of its $1.2 billion agreement with the Environmental Protection Agency to reduce emissions across its 24,000 MW generation portfolio. This agreement, achieved by a financially strong entity with supportive local regulatory treatment provided clear costs and benefits to its signors.

In contrast, capital providers to the industry can be expected to react poorly to financially significant expenditures required of utilities and unregulated generators in the absence of clarity and permanence, but rather in the context of potentially shifting requirements, unproven technologies and uneven regulatory treatment. This need for clarity has heightened importance now, at a time when industry participants have been roiled by unprecedented financial disruptions and failures, and by persistent uncertainties elsewhere in the public policy arena. Investors and company leaders are currently wrestling with a variety of fundamental uncertainties: state-by-state changes in policies related to industry restructuring; purchased power contract disputes, as in California; accounting standards revisions related to energy purchasing, trading and hedging activities; uncertainty over aspects of currently pending energy legislation such as PUHCA reform; FERC transmission policy, transmission siting rules, and transmission-related tax policy on transfers in ownership; and certain aspects of bankruptcy code reform, just to name a few.

Clarity as to the durability of legislative requirements is, for investors in the power sector, not just a modest benefit, it is a defining attribute. Typically, utility companies' economics depend predominantly on the policy decisions of State regulators, and the framework of regulatory decisionmaking has very significant comparative impacts on those companies' access to and cost of capital. To wit, California utilities, which, in my view, have experienced many years of regulatory antagonism and turmoil, exacerbated by and culminating in the 2001 statewide energy crisis, trade at a consistent discount to non-California utilities. For example, today, the average non-California utility enjoys a 32 percent price-to-earnings valuation premium to the average of the three major California investor owned utilities. It is in the context of such selective localized uncertainty that Federal policies related to large, new emissions-reduction expenditures must be unambiguous and durable.

One important attribute of legislation to reduce power generator emissions which supports the objective of clarity is the abundance of market signals from freely traded emissions allowances. Allowance trading improves the ability of affected companies to make clear choices as to the most cost effective of various strategies they can deploy in meeting emissions-reductions targets and promotes capital efficiencies when capital is scarce.

Stress in the Sector

The basic requirement for clarity in policy decisions related to what one of your prior witnesses has identified as one of the largest private industry investment initiatives ever conceived comes at a time when the financial health of the industry is, at best, on the mend from a dramatic and troublesome financial cycle.

Rather than recount the multiple factors and contributing exogenous occurrences which created the downturn in the merchant energy sector and its related impacts on utilities, I will focus on its current health and the cost-of-capital implications of that current state.

One co-determinant of the cost of funds and access to bond investors for industry participants is the credit rating agency's public assignment of a rating to a particular issuer or a particular security issued by a company. In a stable industry and economic environment, investors might expect to see an equal number of upgrades to downgrades to such ratings.

The electric sector industry is in the midst, though perhaps the trailing end, of the worst ever period for credit rating deterioration. Since January 1, 2002, we have seen 232 separate rating downgrades (some of multiple rating categories at one time) versus only 18 ratings upgrades. These downgrades are a symptom, and effect of massive investor losses on bonds and bank loans to companies in the sector, and in the merchant power generation market in particular.

Whereas underlying US Treasury yields have improved materially and access to high yield or sub-investment grade bond markets has also improved markedly over the last 12 months, these helpful indicia should not obscure a central point: the industry has been systematically downgraded in relative risk/reward terms. This fact may well have a large, adverse impact on cost of and access to capital long after the current rally in Treasuries or junk bonds subsides.

Also, during the 2 years ending March 31, 2003, equity losses for investors have been staggering as well. The collective equity market capitalizations of seven selected merchant power industry participants alone, even excluding Enron, declined by $93 Billion from 2 years earlier, when the same entities were capitalized by the market at $102 billion, a staggering loss across some of the then most admired names in the industry.

There are broader impacts on the power sector of the recent merchant power sector value destruction episode. In recent years, statewide restructuring in California, New York, Illinois, Texas, Pennsylvania, Ohio, Delaware and Washington, DC, has resulted in the large legacy generation portfolios of incumbent utilities to be transferred in those locations to unregulated power merchants, many of which have experienced a sharp decline in financial strength. This creates some potential for new counterparty exposures for electric distribution companies who rely on unregulated megawatt-hours to meet supply needs.

Indeed, some 2/3's or more of the generation capacity sold by ConEd in New York City, by DQE in Pittsburgh, by Pepco in Washington, DC, by Commonwealth Edison and by Illinova in Illinois, is now owned by one of the merchant power owners caught up in the financial turmoil referred to above. These generation companies are rated significantly below investment-grade rated by the credit rating agencies and are experiencing limited access to new capital.

Thus, in some cases, even those utilities whose parent companies did not embark upon a growth-focused expansion into unregulated merchant power in 2001–2002 now find a different, vexing credit issue: a weak counterparty on which they depend for the bulk of their reliable power supply. These unregulated counterparts are poorly equipped to absorb a large financial obligation, particularly in the context of any lack of clarity on the costs and benefits of such expenditures.

Clarity Will Drive Capital Access

In evaluating legislation to reduce power generator emissions which envisions one of the nation's most ambitious private industry investment programs ever conceived, I would submit that committee members examine several important market dynamics: multiple critical uncertainties in upcoming energy policy and regulatory decisions, uncertainties related to fuel cost and availability, and, generally, the weakened financial capacity of the industry's generation participants.

In this context, moving forward with legislation that provides clarity, durability and an efficient means to allocate expenditure decisions can be an important step toward assuring that sufficient, well-priced capital will be available from private investors to make such significant future expenditures. That assurance is important both for the success of an emissions-control policy objective, and also for the health of a critical infrastructure industry in this nation's economy.

STATEMENT OF DOUGLAS COGAN, DEPUTY DIRECTOR, SOCIAL ISSUES SERVICE, INVESTOR RESPONSIBILITY RESEARCH CENTER

My name is Douglas G. Cogan. I am the Deputy Director of Social Issues for the Investor Responsibility Research Center. IRRC is an independent research firm, based in Washington, DC, that provides impartial information on corporate governance, social and environmental issues affecting investors and corporations worldwide. Founded in 1972, IRRC serves more than 500 institutional investors, corporations, law firms, universities, foundations, religious institutions and other organizations.

IRRC does not take advocacy positions on public policy issues. Accordingly, I will not be commenting on the merits of specific clean air bills being considered by this committee. I will address three broader issues as they relate to the merits of legislation that includes CO_2 emissions controls. These issues are:

1. The inevitability of carbon dioxide controls.
2. The need for more corporate disclosure and investor certainty on the climate change issue.
3. The connection between climate change and good corporate governance practices.

Inevitability of carbon dioxide controls

IRRC has long served as an early warning system for the business and investment community. In the 1970's, IRRC published reports on the coming deregulation of the electric utility industry and obstacles facing nuclear power. In the 1980's, IRRC issued studies on the advent of renewable energy and utility energy efficiency programs. In 1992, IRRC published a book written by me on business and investment responses to climate change.

Climate change is playing an increasingly important role in capital investment decisions, especially for the electric power industry. Our nation's electricity providers account for nearly 40 percent of America's and 10 percent of the world's manmade CO_2 emissions. Addressing global warming necessarily involves this industry. Companies and investors that ignore this fact do so at their own peril.

The question is not whether there will be CO_2 controls on power plant emissions, but when. Investors need more disclosure and guidance on this issue. Congress can help by passing legislation that enables utilities and investors to plan effectively for the future and reduce prevailing uncertainties.

Need for more corporate disclosure and investor certainty

Climate change is the greatest environmental challenge facing the electric utility industry. Yet many companies still hardly acknowledge the issue in their disclosure statements to investors. At best, companies say CO_2 emissions controls could have a material impact on their financial condition, but cannot gauge the magnitude of the effect. At worst, they say virtually nothing at all.

Investors are left to wonder whether this paucity of disclosure reflects a lack of guidance and foresight, or a reluctance to acknowledge the strategic and material risks posed by climate change. Neither answer is acceptable to investors.

Electric utilities are committing tens of billions of dollars to upgrade their coal-fired power plants and install modern pollution control equipment. Yet these investments do nothing to address carbon dioxide emissions. The most expensive climate change response strategy will be to institute CO_2 emissions controls after investing in equipment to control sulfur dioxide, nitrogen oxide and mercury emissions. A more prudent and cost-effective approach would be to consider these four emissions sources together as part of an integrated strategy.

Consider what James Rogers, Chairman and CEO of Cinergy Corp., one of the nation's largest coal-burning utilities, told this committee 2 years ago. Chairman Rogers said: "Who will make a decision to invest a billion dollars in a new coal plant if you can only guess about future regulation? [A] new power plant bill that fails to address CO_2 will be as dated in 5 years as current law is today."

Investors have raised this very issue with electric utilities over the last 10 years through the filing of shareholder resolutions. With mounting support from large pension systems and endowments, shareholder support for these resolutions has increased dramatically. In the 2003 annual meeting season, the average support level for climate change disclosure resolutions averaged almost 25 percent at three of the nation's largest electric utilities AEP, Southern and TXU. No other type of proposal in the 32-year history of shareholder activism on social and environmental issues has garnered this level of investor support. Such institutional backing is consistent with voting trends that IRRC is seeing across most industries on the global warming issue. (See Figure 1.)

Corporate governance climate change connection

Utilities are under pressure from many quarters to address climate change. States are enacting legislation to fill the policy vacuum at the Federal level. Overseas, the Kyoto Protocol is poised to enter into force, affecting U.S. utilities and other multinationals with operations abroad. The Bush Administration is pressing for more voluntary corporate commitments to control greenhouse gas emissions.

What can utilities do to respond to these pressures? And can you do to help them?

In terms of what utilities and their investors can do for themselves, IRRC in a soon-to-be-released report commissioned by CERES finds that companies can integrate climate change into good governance practices. Our study lists 14 specific actions. I highlight three vitally important ones here:

- First, companies should provide regular assessments of the climate change issue to shareholders, based on systematic board reviews of company risks and opportunities. In place of blanket statements in securities filings that climate change poses undeterminable material risks, at a minimum companies should identify the risk factors and parameters involved in board assessments.
- Second, companies need to set CO_2 emissions baselines and provide annual emissions data by which investors can gauge prevailing emissions trends. Utilities have been reporting such data to the U.S. Environmental Protection Agency for 10

years. They should make this information directly available to shareholders as well. (Some are already doing so.)

- Most important, utilities should be making forward-looking disclosures of their CO_2 emissions. As an industry, electric utilities have pledged to reduce the carbon intensity of their emissions by 3 to 5 percent by 2012. But actual emissions projections and the effects of proposed CO_2 controls vary substantially from company to company, and such information typically is not shared with investors. (See the attached IRRC Proxy Issues Reports on Southern Company and TXU Corp. as examples.) Investors cannot begin to make meaningful evaluations of the potential impacts of CO_2 legislation on their portfolio holdings until they have access to such forward-looking information.

Congress can facilitate this disclosure process by requiring utilities and other major carbon emitters to report not only past emissions data, but also future projections in securities filings. To be fully transparent in this disclosure, aggregate emissions data as well as emissions intensity ratios should be provided.

The most helpful thing this Congress can do, however, is to establish once and for all that carbon dioxide is an emissions source that will be controlled. Many investors see this coming. Regardless of the targets and timetables, this act alone would provide essential guidance for investors and company directors that have put climate change on their corporate governance agenda.

What has made this issue so difficult to address is a gap in governance decision-making. A CEO typically looks out only three to 5 years when making a big capital investment, or about as long as he or she normally serves in office. The investment planning horizon for a long-lived asset like a power plant may extend up to 15 years. But the power plant will operate for 30 years or more. Carbon dioxide emissions from that power plant will stay in the atmosphere for 100 years or more long after the CEO and even the plant itself is retired. (See Figure 2.)

Institutional investors suffer the consequences of this governance gap. e are the ones entrusted with pension, insurance and endowment assets designed to span generations. These investors have a fiduciary duty to advance governance reforms to ensure the long-term viability of these assets and the economy as a whole. As our nation's elected representatives, you play a complementary role and are in a position to bridge this governance gap.

A more detailed treatment of these issues appears in the forthcoming IRRC report commissioned by CERES, Climate Change and Corporate Governance: Making the Connection. Excerpts are attached to my written testimony. They include profiles of the top five carbon emitting investor-owned electric utilities. These profiles illustrate the wide divergence in board oversight and current reporting mechanisms used by these companies and demonstrate the need for a more concerted approach. Thank you for this opportunity to testify. I am happy to answer your questions and assist you in any way I can.

IRRC SOCIAL ISSUES SERVICE, 2003 COMPANY REPORT—J2

SUMMARY

Resolution

RESOLVED: That the Board of Directors report by August 2003 to shareholders on (a) the economic risks associated with the Company's past, present and future emissions of carbon dioxide, sulfur dioxide, nitrogen oxide and mercury emissions, and the public stance of the company regarding efforts to reduce these emissions and (b) the economic benefits of committing to a substantial reduction of those emissions related to its current business activities (i.e., potential improvement in competitiveness and profitability).

Similar resolution last year? No

Proponents

Benedictine Sisters Charitable Trust (200 shares), Congregation of the Sisters of Charity of the Incarnate Word and Congregation of the Holy Cross, Southern Province (70). The proponents are church groups affiliated with the Interfaith Center on Corporate Responsibility.

At Issue/New Developments

TXU is the nation's seventh largest investor-owned electric utility, with more than 19,000 megawatts of generating capacity in Texas. Largely reliant on natural gas and coal, TXU is the 5 industry emitter of carbon dioxide, accounting for 3.2 percent of U.S. utilities' CO_2 emissions in 2000, according to an independent benchmarking study. TXU also is a large industry emitter of sulfur dioxide and nitrogen oxides

pollutants that contribute to acid rain, smog and human health problems. Management opposes the requested report as being "unreasonably speculative with respect to any future emissions reductions" of these pollutants.

TXU is making substantial investments in pollution control technology to comply with the Clean Air Act. Management does not say what portion of its overall capital expenditures are being spent to meet these requirements, however. TXU notes in its 2002 Form 10-K that a "significant portion" of its generating fleet was constructed "many years ago" and "may require significant capital expenditures" as well as "periodic upgrading and improvement." Future government controls of CO_2 emissions could threaten the economic viability of some of TXU's planned power plant retrofits.

New developments at the company: In October 2002, TXU announced plans to terminate and write off its European operations. TXU's stock plunged on the news. The company and its managers now are defendants in several derivative shareholder lawsuits.

Economic Impact on the Company

While TXU is making large investments to meet Clean Air Act requirements likely totaling hundreds of millions of dollars a year such investments will not reduce TXU's CO_2 emissions. New government controls on such emissions could render some of its power plant upgrades uneconomic. Management does not provide shareholders with a clear sense of how much it is spending on pollution control, nor does it indicate whether future CO_2 emissions controls would have a material impact on the company. The requested report seeks more definitive answers to these questions.

I. TXU CORP. AND GLOBAL CLIMATE CHANGE

TXU Corp. is the nation's seventh largest investor-owned electric utility, serving 5 million electricity and gas customers in the United States and Australia. (TXU is working with creditors to sell its operations in Europe.) TXU also provides wholesale energy sales, merchant energy trading and risk management, energy-related services and telecommunications.

TXU owns or leases 19,000 megawatts of generating capacity in Texas, where 2.7 million of its electricity customers are located. (TXU's Texas operations are subject to competition, beginning in 2002.) TXU also sells about 200 billion cubic feet of natural gas annually to 1.4 million customers. TXU Australia serves about 1 million electricity and gas customers, and owns and operates 1,280 MW of generating capacity. As of Dec. 31, 2002, TXU employed 14,600 people.

Financial Performance

	2002	2001	% change to 2002
Revenues (in billions $)	10.034	10.049	(0.1)
Net income (in millions $)	(4,232)	655	NA

2002 financial results: TXU lost $4.2 billion in 2002, and the company's book value was cut in half. On a per share basis, TXU's 2002 loss was $15.23 per share, compared with earnings of $2.52 per share in 2001. This most difficult year in the company's 121-year history included a decision last October to discontinue and write off its European operations. On Oct. 12, management announced it was cutting the company's common stock dividend by 80 percent, to 12.5 cents per share, in response to capital market concerns regarding the liquidity of TXU Corp. and its U.S. and Australian subsidiaries. TXU and its top executives now are defendants in several derivative shareholder lawsuits, alleging (among other things) false and misleading statements in company securities filings, breach of fiduciary duty, abuse of control, mismanagement, waste of corporate assets, and breach of the duties of loyalty and good faith.

Investment Performance

Data as of 12–31–2002	Total returns (percent)		
	1 yr	3 yr	5 yr
TXU Corp.	−58.6	−38.1	−40.8
S&P 500 index	−22.1	−37.6	−2.9

Investment Performance—Continued

Data as of 12–31–2002	Total returns (percent)		
	1 yr	3 yr	5 yr
Industry group No information Industry description: Electric Utilities No. of companies in group: 200.			

Source: Compustat

Environmental expenditures and liability: TXU does not provide a breakdown of its expenditures for capital projects related to the environment, nor does it provide a projection of future such expenditures. In its 2002 Form 10-K, management notes that a "significant portion of TXU Corp.'s facilities was constructed many years ago. In particular, older generating equipment, even if maintained in accordance with good engineering practices, may require significant capital expenditures to keep it operating at peak efficiency. This equipment is also likely to require periodic upgrading and improvement."

TXU reported a total of $996 million in capital expenditures in 2002, down from $1.248 billion in 2001. Total capital expenditures are expected to be $1.1 billion in 2003, substantially all of which are for maintenance and organic growth of existing operations.

Under the Clean Air Act and State electric utility restructuring legislation, "grandfathered" power plants (built before 1978) must achieve a 50 percent reduction in nitrogen oxides (NOx) emissions and a 25 percent reduction in sulfur dioxide emissions by May 1, 2003. This requirement will be met through emission reductions at these facilities or through the purchase of credits from other permitted facilities as an alternative to achieve the same reductions. TXU reports in its 2002 Form 10-K that it has obtained all of the necessary permits to meet these requirements, and says it can expect recovery of reasonable environmental improvement costs as part of the State-approved electric restructuring plan.

As part of the State Implementation Plan for the Clean Air Act, TXU also must comply with a requirement calling for an 89 percent reduction in NOx emissions in the Dallas-Fort Worth ozone non-attainment area and a similar 51 percent reduction from power plants in East and Central Texas. TXU says the cost of compliance will be reduced because of the emission trading provisions in the rules.

TXU and Its Environmental Affairs

Board oversight: TXU's nine-member board of directors has seven standing committees. No board committee is charged with explicit oversight of the company's environmental affairs. The board of directors has not conducted a formal review of the climate change issue. The company has not set targets to reduce carbon dioxide or other greenhouse gas emissions, but says it strives to develop and implement workable and economically viable emissions reduction projects.

Staff level: TXU employs about 150 environmental, health and safety professionals. The top EHS executive is Paul Plunket, Executive Vice President, who reports to Tom Baker, TXU Corp. Executive Vice President and President of TXU's Oncor energy distribution business. There is one reporting level between Plunket and the CEO of the company. TXU has conducted company-wide environmental audits since 1987; audits of major facilities are conducted every year. Its business units are benchmarked against the ISO 14001 environmental management system standard. The audit committee of the board of directors reviews audit results; audit summaries are not made pubic. TXU says environmental performance is a factor in the compensation of top executives, plant managers and other employees.

TXU is one of three U.S. utility companies listed on the Dow Jones Sustainability Index. In June 2002, Innovest Strategic Value Advisors, Inc. recognized TXU as the fourth highest-ranking company out of 28 utilities evaluated based on environmental risk factors, enviornmental management capacity and environmental opportunity factors. Innovest also found that TXU was below the industry average in terms of its exposure to a possible carbon tax relative to its stock market capitalization (as of Jan. 1, 2000).

Environmental principles and reporting: TXU has issued an environmental report annually since 1991. (The report and its Statement of Environmental Principles is available in printed form and on the Internet at www.txucorp.com/globcit/envcom/globalreport/principles.) The latest report includes a brief policy statement on climate change and carbon savings/offsets achieved in the United States and Australia. The report also includes statistics on TXU's sulfur dioxide, nitrogen oxide and carbon dioxide emissions rates as compared to national electric utility averages and the company's investments in wind energy.

Under the Clean Air Act Amendments of 1990, TXU is required to collect hourly emissions data on carbon dioxide, nitrogen oxides and sulfur dioxide. The power plant emissions data are recorded in a data base maintained by the U.S. Environmental Protection Agency. The company also provides a summary of annual mercury emissions from its lignite/coal generating facilities on its website and annually reports these emissions to the EPA, which makes the information publicly available on the Internet in the Community Right-to-Know data base.

TXU and Global Climate Change

As part of its Statement of Environmental principles, TXU says it will "continue to take prudent steps to voluntarily reduce our emissions of greenhouse gases and to promote carbon sequestration programs." It says it has set "challenging sustainability targets in the medium and long term" that include increased use of renewable fuels, reducing greenhouse gas emissions through more efficient electricity production and use, assisting carbon sequestration through reforestation and other technologies, and actively promoting conservation and load management programs. Quantitative targets have not been set, however.

In its 2002 annual report, TXU says it "supports a balanced, flexible, comprehensive and international approach to the global climate change issue." It does not comment on the Kyoto Protocol, an international agreement that seeks a 5 percent cut in industrialized nations' CO_2 emissions below 1990 levels by 2012. In its 2002 Form 10-K, management says, it is "unable to predict the impact of the [Bush] Administration proposal or related legislation" on climate change.

Carbon dioxide emissions: As noted above, TXU reports information to government agencies about its CO_2 emissions, but it does not make this information readily available to shareholders. Through use of Continuous Emissions Monitors on its major power plants, TXU reported carbon dioxide emissions equal to 66.8 million metric tons (MMT) in 2000. Separately, TXU told IRRC that its operations in the United States and Australia emitted 72.8 MMT of CO_2 in 2001. TXU also collects data on emissions of two other greenhouse gases, methane and sulfur hexafluoride.

According to an independent benchmarking study conducted by the Natural Resources Defense Council, TXU was the fifth largest utility emitter of carbon dioxide in 2000, accounting for 3.2 percent of U.S. utilities' CO_2 emissions. That year, natural gas provided 61 percent of its generation; coal/lignite, 28 percent; and nuclear, 11 percent. TXU's high ranking in the benchmarking study was mainly a function of its large generating base, totaling more than 19,000 megawatts of capacity. Because its main source of fuel is natural gas (which has a lower carbon content than coal or oil), it ranked 56th out of 100 utilities studied in terms of CO_2 emissions per megawatt-hour (MWh) of generation, and it ranked 71st out of 100 in terms of CO_2 emissions per MWh of generation from fossil energy plants. Other utilities with lower rankings (i.e., closer to 1) had higher CO_2 emissions per unit of power produced.

TXU reported in its 2001 environmental report that its CO_2 emissions rate in 2000 was 11 percent below the national average (based on tons of CO_2 emitted per million Btus of energy produced). Similarly, its sulfur dioxide and nitrogen oxides emissions rates were 33 and 15 percent below the national average, respectively. The NRDC benchmarking study reported that TXU ranked fifth in terms of total utility emissions of nitrogen oxides in 2000, and 12th in terms of sulfur dioxide emissions.

Emissions savings: TXU has been a member of the U.S. Department of Energy's Climate Challenge program since 1995, and it has reported emissions savings under the Section 1605(b) reporting program established by the 1992 Energy Policy Act. TXU reported savings/offsets of 23 million metric tons of CO_2 equivalent in 2001 and a total of 196 MMT of savings since 1991 more than any other U.S. investor-owned electric utility. TXU says its CO_2 emissions would have been 28 percent higher in 2001 were it not for savings and offsets achieved since 1990.

Most of TXU's savings are from operation of its Comanche Peak nuclear units, which came on line in the early 1990's. The Energy Policy Act allows utilities to count as savings any new generation from nuclear power plants that began operation or increased their output after 1990. (Comanche Peak is the only U.S. investor-owned nuclear plant completed after 1990.) Other sources of TXU's emissions savings include heat rate improvements in its fossil energy plants, demand-side management programs, methane recovery, sulfur hexafluoride reduction programs and tree planting.

In 2001, TXU reported 527,400 tons of emissions savings through its demand-side management programs. The company has planted more than 20 million trees since the early 1970's, including 1.3 million in 2002. TXU Australia reported savings/off-

sets of 230,000 tons in 2001. TXU Australia is expected to achieve a 16 percent reduction in its total greenhouse gas emissions by 2004.

Renewable energy: TXU says it encourages "research and development of more efficient, environmentally benign sources of energy and, whenever warranted by market opportunity, to offer customers the benefits of energy produced from renewable resources." TXU offers a "green pricing" option in each jurisdiction it serves. TXU has contracts for 382 megawatts of wind power in Texas, making it the fourth largest purchaser of wind power in the United States. It also has contracts for approximately 20 MW of wind power in Australia and 30 MW of hydro and landfill gas generating capacity. TXU says it is also evaluating photovoltaic, solar thermal, waste-to-energy and biomass technologies.

II. PROPONENTS' POSITION

This is the second time that shareholder proponents affiliated with the Interfaith Center on Corporate Responsibility have submitted a global warming resolution to TXU Corp. In 1997, a resolution filed with its predecessor, Texas Utilities, was withdrawn. TXU was targeted again this year because it has been identified as one of the top five carbon-emitting investor-owned electric utilities. The proponents met TXU's corporate secretary and members of the company's environmental staff in March 2003. Though the discussions were amiable, the proponents elected not to withdraw the resolution on the basis that TXU was not willing to provide sufficient forward-looking information on the climate change issue.

The resolved clause of the resolution has two elements. It asks the company's board of directors to report on:

(a) the economic risks associated with the Company's past, present and future emissions of carbon dioxide, sulfur dioxide, nitrogen oxide and mercury emissions, and the public stance of the company regarding efforts to reduce these emissions and (b) the economic benefits of committing to a substantial reduction of those emissions related to its current business activities (i.e., potential improvement in competitiveness and profitability).

In a presentation by Ceres, a coalition working closely with the Interfaith Center on the 2003 shareholder campaign, arguments made in favor of the global warming resolution filed with electric utilities are as follows:

1. Health and environmental risks from pollutants: Electric utilities account for two-thirds of the nation's sulfur dioxide emissions, one-third of its mercury emissions and nearly one-quarter of its nitrogen oxides emissions. These pollutants contribute to asthma, lung and heart disease and mercury bioaccumulation in humans, and cause extensive damage to the environment, including acid rain, smog and mercury bioaccumulation in fish and other species. At the same time, electric utilities account for 37 percent of the nation's carbon dioxide emissions, the main gas tied to global warming.

2. Government regulation of these pollutants: Emissions of sulfur dioxide and nitrogen oxides are regulated under the Clean Air Act. This Federal law will require substantial additional reductions of these emissions as well as mercury in the years ahead. Utilities will have to make major new investments in pollution control technology, but this technology will not control carbon dioxide emissions.

3. Risks of not factoring in carbon dioxide controls: The proponents believe domestic regulatory controls of CO_2 are inevitable. Two States (New Hampshire and Massachusetts) have already passed laws restricting utility emissions of CO_2, and Federal legislation has been introduced as well. At the international level, the Kyoto Protocol is likely to go into effect this year (although the Bush Administration has pulled the United States out of the agreement).

According to studies cited by the proponents, the most expensive choice utilities could make is to retrofit existing fossil energy plants with new pollution control equipment and then have to reduce CO_2 emissions from these plants. The proponents argue that utilities should factor future CO_2 controls into their investment strategies now, since it could alter decisions about which power plants to retrofit with new pollution control equipment and which to replace with new, cleaner energy sources.

4. Need for greater disclosure by utilities: By some estimates cited by the proponents, many electric utilities face a "carbon exposure" of between 10 and 35 percent of their total market capitalization. (In other words, the cost of achieving carbon dioxide emission controls as specified by the Kyoto Protocol equals 10 to 35 percent of the current value of their stock.) Many factors go into making this calculation, including a utility's generating assets, fuel mix, installed pollution control technologies and whether it is competing in a deregulated electricity market. "Investors cannot assess this risk without more disclosure" from utilities, according to Ceres.

That is why the proposal calls on management to conduct a thorough economic assessment of the risks and benefits of achieving substantial emissions reductions of the four pollutants listed in the proposal. "We believe that taking early action on reducing emissions and preparing for standards could better position companies over their peers, including being first to market with new high-efficiency and low-emission technologies," the proponents argue. "Changing consumer preferences, particularly those relating to clean energy, should also be considered. Inaction and opposition to emissions control efforts could expose companies to reputation and brand damage, and regulatory and litigation risk," it concludes.

III. MANAGEMENT'S POSITION

Management opposes the resolution seeking more disclosure on the company's efforts to address climate change. It argues that the resolution would duplicate company reporting activities, increase costs and "require unreasonable speculation with respect to the economic risks and benefits of emissions and future emission reductions."

Management says it complies with government requirements to monitor and annually report to the Environmental Protection Agency emissions of carbon dioxide, sulfur dioxide, nitrogen oxides and mercury. The public can gain access to this information through government Internet sites.

TXU also publishes an annual environmental report that includes information comparing its sulfur dioxide, nitrogen oxide and carbon dioxide emissions rates to national electric utility averages. The report also highlights its voluntary reductions in carbon dioxide emissions and other greenhouse gases and its investments in wind energy. Management says its "public stance regarding efforts to reduce these emissions is embodied in its Statement of Environmental Principles and is summarized in the company's annual environmental report."

Management says additional information on the environmental risks associated with emissions is available in public reports filed with the Securities and Exchange Commission. "The reports address capital construction costs for sulfur dioxide and nitrogen oxide emissions control equipment necessary under current regulations, certain material risks associated with environmental compliance, and certain legislative and regulatory initiatives that may, in the Company's determination, materially impact its operations," according to the proxy statement.

Finally, in response to the proponents' request for more information on the economic risks and benefits of future emissions controls and efforts to reduce these emissions, management says it "cannot accurately predict the outcome of future Federal or State legislative actions to regulate emissions" and that the requested report would be "unduly speculative."

IV. IRRC ANALYSIS

SmartVoter Guidelines

Voting guidelines for this resolution are presented under issue number 3425 in IRRC's SmartVoter product.

Questions Raised

- Is TXU reporting adequately on the global warming issue?
- Could TXU do more to respond to this issue?

Adequacy of reporting: The proponents believe that management should provide shareholders with more information on the company's response to global warming. In particular, the proponents want management to lay out the costs and benefits of reducing greenhouse gas emissions as it invests in other pollution controls at its fossil-fired generating facilities. Management says it is already making information on its emissions publicly available and that the additional information requested by the proponents would be "unduly speculative."

Management can legitimately say that it is providing some information to shareholders on this issue:

- Disclosure: It makes reference to the global warming issue in its 2002 annual report and Form 10-K.
- Emissions: Its 2001 environmental report provides comparative statistical information on its emissions of carbon dioxide, sulfur dioxide and nitrogen oxides, and its efforts to reduce these emissions.
- Data bases: Its proxy statement cites government data bases where shareholders can find more detailed information on the company's emissions.

Shareholders who wish to conduct more than a cursory analysis of the company's response to global warming and its exposure to risks from controlling emissions may

find management's level of disclosure inadequate, however. Here are some examples:

- Disclosure: Management says in its 2002 annual report that it "supports a balanced, flexible, comprehensive and international approach to the global climate change issue." But it does not make any mention of the Kyoto Protocol, the pending international agreement to address climate change, or indicate whether the company has any targets to reduce its greenhouse gas emissions. The Form 10-K statement also sheds little light on these questions. It says only that management is "unable to predict the impact of the [Bush] Administration proposal or related legislation" on climate change.
- Emissions: Management says in its environmental report that its emissions of CO_2, SO_2 and NOx are below the national average per unit of electricity produced. But it does not provide absolute emissions figures, which reveal the company to be one of the nation's largest emitters of each of these substances. Among U.S. electric utilities in 2000, TXU ranked fifth in CO_2 and NOx emissions, and 12th in SO_2 emissions.
- Data bases: Management makes reference to government data bases where its aggregate emissions figures can be found. It says in its 2003 proxy statement that such data bases demonstrate the company's "support for, and progress toward, voluntary reductions of greenhouse gas emissions." But management does not provide links or Internet addresses to these government sites, which would assist interested parties in tracking down this information. Moreover, management does not explain why it omits aggregate emissions figures in its own reports to shareholders and instead normalizes the data based on electricity production. Providing aggregate data would enable shareholders to better scrutinize management's claims of progress toward absolute emissions reductions.
- Financial implications of regulatory controls: Finally, management provides very little information to shareholders about its capital expenditures related to environmental protection. It provides figures for recent and projected total capital expenditures for the company. It also notes that many of its power plants have had to obtain permits to come into compliance with new Clean Air Act standards. But it does not break out how much of its capital expenditures are being used for such environmental purposes. Separately in its Form 10-K, management warns that a "significant portion of TXU Corp.'s facilities was constructed many years ago" and that these facilities "may require significant capital expenditures" as well as "periodic upgrading and improvement." But it attaches no dollar figures to such warnings. Shareholders are left to ponder whether these expenditures may be material to the company's operations and future financial condition.

Could TXU be doing more to respond to this issue? From the preceding discussion, it is clear that TXU could be doing more to enlighten shareholders about the risks and opportunities posed by efforts to reduce greenhouse gas emissions.

- Disclosure: Management could state in its annual report whether or not it believes the Kyoto Protocol reflects a "balanced, flexible, comprehensive and international approach" to the global climate change issue. It could list in its Form 10-K examples of issues and uncertainties that render it "unable to predict the impact" of climate change proposals, and provide at least a broad outline of the possible magnitude of such impacts.
- Emissions and data bases: Management could provide links or website information to government data bases to which it submits aggregate emissions data. Better still, it could provide this information in its own company reports. Best of all, it could provide historic and projected emissions data so that shareholders can judge for themselves how well the company is doing in "support for, and progress toward, voluntary reductions of greenhouse gas emissions."
- Financial implications of regulatory controls: Management could provide a breakdown of its capital expenditures related to environmental protection as most other companies do in their Form 10-K reports. In particular, management could provide information on its past investments and future projections to keep its fossil energy plants in compliance with the Clean Air Act. In order to satisfy the proponents' request regarding the effects of cutting greenhouse gas emissions, management also could give some indication of how efforts to achieve the goals of the Kyoto Protocol or comparable U.S. legislation might affect its investments in retrofitting and upgrading its older plants.

In the final analysis, shareholders who believe the global warming issue does not yet pose a major policy and financial concern for TXU or who agree with management that further statements on the issue would be "unduly speculative" will be inclined to vote against this proposal. Shareholders who believe the issue does pose concerns despite the legislative uncertainties that remain will be inclined to vote for the proposal. This latter group of shareholders may conclude, in fact, that the uncer-

tain financial consequences of still-evolving response strategies to climate change makes the issuance of a forward-looking report all the more valuable.

EXCERPT FROM TXU CORP.'S PROXY STATEMENT

SHAREHOLDER PROPOSAL RELATED TO AN ENVIRONMENTAL REPORT:

"ELECTRIC UTILITY RESOLUTION

WHEREAS:

In 2001 The Intergovernmental Panel on Climate Change concluded that "there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities."

In 2001 the National Academy of Sciences stated that the "degree of confidence in the IPCC assessment is higher today than it was 10, or even 5 years ago there is general agreement that the observed warming is real and particularly strong within the past 20 years."

The United States government's "Climate Action Report 2002," concluded that global climate change may harm the country. The report highlights risks to coastal communities in the Southeast due to sea level rise, water shortages throughout the West, and increases in the heat index and frequency of heat waves.

In July 2002, 11 Attorneys General wrote President Bush, outlining their concern over the U.S. Climate Action Report's failure to recommend mandatory reductions of greenhouse gas emissions. They declared that States are being forced to fill the Federal regulatory void through State-by-State regulation and litigation, increasing the ultimate costs of addressing climate change. They urged a reconsideration of his regulatory position, and adoption of a "comprehensive policy that will protect both our citizens and our economy."

U.S. power plants are responsible for about two-thirds of the country's sulfur dioxide emissions, one-quarter of its nitrogen oxides emissions, one-third of its mercury emissions, approximately 40 percent of its carbon dioxide emissions, and 10 percent of global carbon dioxide emissions.

Scientific studies show that air pollution from U.S. power plants causes tens of thousands of premature deaths and hospitalizations, hundreds of thousands of asthma attacks, and several million lost workdays nationwide every year from pollution-related ailments.

Standards for carbon dioxide emissions and other air pollutants are emerging across multiple fronts. Ninety-six countries have ratified the Kyoto Protocol, requiring carbon dioxide reductions. Massachusetts and New Hampshire have enacted legislation capping power plants emissions of carbon dioxide and other air pollutants. In June 2002 the Senate Environment and Public Works Committee passed a bill seeking to cap emissions from the generation of electric and thermal energy.

We believe that taking early action on reducing emissions and preparing for standards could better position companies over their peers, including being first to market with new high-efficiency and low-emission technologies. Changing consumer preferences, particularly those relating to clean energy, should also be considered.

Inaction and opposition to emissions control efforts could expose companies to reputation and brand damage, and regulatory and litigation risk.

RESOLVED: That the Board of Directors report (at reasonable cost and omitting proprietary information) by August 2003 to shareholders on (a) the economic risks associated with the Company's past, present and future emissions of carbon dioxide, sulfur dioxide, nitrogen oxide and mercury emissions, and the public stance of the company regarding efforts to reduce these emissions and

(b) the economic benefits of committing to a substantial reduction of those emissions related to its current business activities (i.e. potential improvement in competitiveness and profitability)."

The Board of Directors recommends a vote AGAINST this proposal for the following reasons:

The Company believes that adoption of the shareholder proposal would unnecessarily duplicate ongoing Company reporting activities, would needlessly increase costs and require unreasonable speculation with respect to the economic risks and benefits of emissions and future emission reductions.

The Company routinely reports to regulatory agencies and the public regarding significant environmental matters. Since 1991, the Company has voluntarily published an annual environmental report, available in printed form and on the Internet, which sets forth its Statement of Environmental Principles and presents statistics on the Company's sulfur dioxide and nitrogen oxide emissions rates as com-

pared to national electric utility averages, voluntary reductions in greenhouse gas emissions (including carbon dioxide), and investments in zero-emission wind energy.

The Company also annually reports emissions of sulfur dioxide, nitrogen oxide and carbon dioxide, which are continuously monitored at the generating facilities as required by law, to the State and Federal environmental agencies, including the U.S. Environmental Protection Agency (EPA), which makes this information publicly available through the Emissions Scorecard data base on the Internet.

The Company also provides a summary of annual mercury emissions from its lignite/coal generating facilities on its web page and annually reports these emissions to the EPA, which makes the information publicly available on the Internet in the Community Right-to-Know data base.

The Company's public stance regarding efforts to reduce these emissions is embodied in its Statement of Environmental Principles and is further reflected in its record of compliance with State and Federal sulfur dioxide and nitrogen oxide emissions requirements and reductions, which is summarized in the Company's annual environmental report. The Company's public support for, and progress toward, voluntary reductions of greenhouse gas emissions (including carbon dioxide) is reported annually to the U.S. Department of Energy, which makes the information available in the Public Use Data base on the Internet.

The Company routinely discloses the economic risks associated with emissions in its public reports filed with the Securities and Exchange Commission. The reports address capital construction costs for sulfur dioxide and nitrogen oxide emissions control equipment necessary under current regulations, certain material risks associated with environmental compliance, and certain legislative and regulatory initiatives that may, in the Company's determination, materially impact its operations.

In its normal course of business, the Company evaluates possible additional emissions reductions beyond those required by State and Federal regulations. The Company believes that a more detailed report on the economic risks and benefits of emissions and emissions reductions would be unreasonably speculative with respect to any future emissions reductions. For example, the Company cannot accurately predict the outcome of future Federal or State legislative actions to regulate emissions.

In summary, adoption of the shareholder proposal would unnecessarily increase costs and duplicate ongoing Company reporting activities.

The Board of Directors Recommends a Vote AGAINST This Shareholder Proposal.

[SOCIAL ISSUES SERVICE, MAY 6, 2003]

IRRC, 2003 Company Report J2

SOUTHERN CO.

Global Climate Change

(by Doug Cogan)

2003 Investor Responsibility Research Center

Proxy Statement Proposal Related IRRC report 1. Elect directors CG Proxy Report 2. Ratify amendment of by-laws permitting book-entry of shares CG Proxy Report 3. SP-Report on greenhouse gas emissions SI Background Rpt. J2

SUMMARY

Resolution

RESOLVED: That the Board of Directors report by August 2003 to shareholders on (a) the economic risks associated with the Company's past, present and future emissions of carbon dioxide, sulfur dioxide, nitrogen oxide and mercury emissions, and the public stance of the company regarding efforts to reduce these emissions and (b) the economic benefits of committing to a substantial reduction of those emissions related to its current business activities (i.e., potential improvement in competitiveness and profitability).

Similar resolution last year? No

Shareholder proposals asking Southern to report on the costs and liabilities of climate change were filed and withdrawn in 1997, 1999 and 2002. A proposal on developing renewable energy was supported by 9.5 percent of shares voted in 2001 and 9.2 percent in 2002.

Proponents

Sisters of Charity of St. Elizabeth (100 shares); United Church Foundation (23,400 shares); Sisters of St. Dominic, Caldwell, N. J. (100 shares); affiliated with the Interfaith Center on Corporate Responsibility.

At Issue/New Developments

Southern Company is the nation's second largest electric utility, with 37,000 megawatts of generating capacity. Coal represents about two-thirds of Southern's fuel mix, making it the 2 industry emitter of carbon dioxide, accounting for 6.4 percent of U.S. utilities' CO_2 emissions in 2000, according to an independent study. It is also the 2 industry emitter of sulfur dioxide, nitrogen oxides and mercury. Southern plans to spend more than $1 billion by 2004 for nitrogen oxides emissions controls at its coal-fired plants. It expects to spend an additional $4 billion or more by 2015 to further reduce emissions of sulfur dioxide, nitrogen oxides and mercury. Government efforts to control CO_2 emissions could call into question the economic feasibility of some of these pollution control efforts. Southern has provided projections of its power generation and emissions through 2020. It estimates that its power generation will increase 45 percent between 2000 and 2020 and that its CO_2 emissions will increase 16 percent. Management says it is focused on "addressing emissions of greenhouse gases such as CO_2."

Economic Impact on the Company

Because electricity generation accounts for nearly two-fifths of the nation's CO_2 emissions, the principal greenhouse gas, imposition of new government controls on CO_2 could compromise the future value of Southern's planned investments in pollution control equipment at many of its coal-fired power plants. Southern says in its Form 10-K report that the "cost impacts of such [CO_2] legislation would depend upon the specific requirements enacted." The requested report asks management to provide a more detailed explanation of the costs and benefits of the company's pollution control strategy, given that there may be material risks to the company and its shareholders if that strategy fails to properly anticipate possible future CO_2 emissions controls.

I. SOUTHERN CO. AND ITS ENVIRONMENTAL AFFAIRS

Southern Company is the nation's second largest electric utility, serving 4 million customers in Georgia, Alabama, Florida and Mississippi, with 27,000 miles of transmission lines. Its regulated utility companies Alabama Power, Georgia Power, Gulf Power, Mississippi Power and Savannah Electric provide nearly 90 percent of earnings. The remaining portion of Southern's business activities includes wholesale power generation, a competitive retail natural gas business, energy-related products and services, fiber optics and wireless communications, and leveraged leasing activities. Southern employed 26,178 people as of Dec. 31, 2002.

Southern had 34,739 megawatts of owned and leased generating capacity in its retail system at the end of 2002. Southern Power, its electric wholesale generation subsidiary, had 1,612 MW of natural gas-fired generating capacity in commercial operation. Southern Power expects to have a total of 6,600 MW on-line by the end of 2005. Southern's generation sources in 2002 were coal, 69 percent; nuclear, 16 percent; natural gas, 12 percent; and hydro, 3 percent. Average fuel costs in 2002 were 1.61 cents per kilowatt-hour. Southern's retail electric rates are 15 percent below the national average.

Financial Performance

	2002	2001	% change to 2002
Revenues (in billions $)	10.549	10.155	3.9
Net income (in millions $)	1,318	1,262	4.4

2002 financial results: Southern says its financial performance in 2002 was "very strong and one of the best in the electric utility industry." Net income of $1.318 billion from continuing operations increased 17.6 percent over income from continuing operations reported in 2001. Diluted earnings per share from continuing operations in 2002 were $1.85 per share, up from $1.61 in 2001. Dividends paid per share on common stock in 2002 were $1.355, up from $1.34 in 2001. The company had an average of 708 million shares of common stock outstanding in 2002, an increase of 2.7 percent.

Future construction and environmental expenditures: Southern provides projections for construction expenditures, including environmental capital expenditures, over the next 3 years. Its projected construction expenditures are as follows: $2.075 billion in 2003, $2.308 billion in 2004 and $2.354 billion in 2005. Its projected environmental capital expenditures are $257 million in 2003, $300 million in 2004 and $346 million in 2005. Southern forecasts electricity demand growth of 3.5 percent a year, and customer growth of 1.5 percent a year.

Investment Performance

Data as of 12–31–2002	Total returns (percent)		
	1 yr	3 yr	5 yr
Southern Co.	17.6	123.8	124.9
S&P 500 index	−22.1	−37.6	−2.9
Industry group	No data		
Industry description: Electric Utilities No. of companies in group: 200.			

Source: Compustat

Southern and Its Environmental Affairs

Board oversight: Southern's 10-member board of directors has five standing committees. No board committee is charged with explicit oversight of the company's environmental affairs. The audit committee is responsible for reviewing environmental compliance audits along with other regulatory matters affecting the company. The entire board receives updates on environmental management issues periodically. The 2003 proxy statement makes no reference to environmental issues discussed by the board of directors.

The board of directors has not conducted a formal review of the climate change issue. The company has not set targets to reduce carbon dioxide or other greenhouse gas emissions, but says it is considering them. It has provided projections of carbon dioxide emissions out to the year 2020.

Staff level: Southern employs about 250 environmental, health and safety professionals at the corporate level. The top EHS executive is Dr. Charles H. Goodman, Senior Vice President, Research and Environmental Affairs. Goodman reports to Paul Bowers, President, Southern Co. Generation and Energy Marketing; and Dwight Evans, President of External Affairs. There is one reporting level between Goodman and the CEO of the company. Southern says environmental performance is a factor in the compensation of top executives, plant managers and other EHS employees.

Southern has conducted company-wide environmental audits since 1992. Audits of major facilities are conducted every one to 2 years, and are conducted by corporate and facility staff. The audit committee of the board of directors reviews audit results. Audit summaries are not made public.

Environmental principles and reporting: Southern issued its first environmental policy statement in 1992 and its first environmental report in 1993; it has issued the environmental report periodically since then. The report includes a climate change policy statement, summary of greenhouse gas reduction efforts and a projection of future emissions trends.

Southern's most recent statement on climate change was issued in August 2000. Among other things, the policy statement says:

- Climate change is global and long-term in nature.
- Policies should seek to resolve climate change scientific uncertainties.
- Solutions must incorporate unrestricted use of market-based flexibility mechanism, and consider the broadest range of sources as well as sinks of greenhouse gases, both domestic and international.
- Policies must protect a secure, economic and diverse energy supply, and promote long-term research, development and dissemination.
- Public and private partnerships should support development and commercialization of higher efficiency, lower emitting power generation technologies.
- Cost-effective means should be pursued to reduce, avoid and sequester greenhouse gas emissions.

Southern says in the statement that it is committed to "establishing and maintaining dialog with public and private interest groups to expand the understanding of the climate change issue and to enhance the development and implementation of appropriate climate change policy." The full policy statement is available at: http://www.southerncompany.com/planetpower.asp.

Global Climate Coalition: Southern Company was a founding member of the Global Climate Coalition (GCC), which formed in 1989. For more than a decade, the GCC was the leading industry group opposed to mandatory greenhouse gas controls and U.S. adoption of the Kyoto Protocol. Southern was one of five companies that withdrew from the GCC in late 1999 and early 2000. A Southern spokesman told IRRC that the company was concerned the GCC was "as strident as its most strident member" and that Southern had decided not to align itself with other groups on the climate change issue.

At the time it pulled out of the lobbying group, Southern was facing a global warming shareholder resolution that highlighted its membership in the GCC. That resolution subsequently was withdrawn. The GCC ended its corporate membership program in March 2000, 1 month after Southern left the group, and it disbanded altogether in January 2002.

Renewable Energy Development

Southern is not optimistic about the prospects for renewable energy development, especially in its service area. It says on its website that "renewable energy is more expensive and sometimes dramatically so than power generated by fossil fuels than coal or natural gas. Even if costs weren't a factor, some renewable energy sources aren't available on a large scale in the Southeast." A shareholder proposal filed with Southern on developing renewable energy was supported by 9.5 percent of shares voted in 2001 and 9.2 percent in 2002.

Southern does offer an "EarthCents green pricing" option that allows customers in Alabama and Mississippi to purchase 100 watt blocks of renewable energy for $5–6 per month. Similar programs are awaiting regulatory approval in Georgia and Florida. The energy will come from a portfolio of sources, including landfill methane, wind and solar power. In addition, Southern is conducting research on biomass, solar and landfill methane technologies. For example, Southern is adding switchgrass (a biomass fuel) at two of its power plants to reduce the use of coal and related emissions. It has also installed a 250-kW fuel cell demonstration plant. Fuel cells emit less greenhouse gases inherently than boilers or engines that provide the same energy.

In its 2002 Form 10-K, Southern acknowledges that commercial success of fuel cells and renewables would pose a competitive threat to the company and its shareholders. Management states:

A key element of Southern Company's business model is that generating power at central power plants achieves economies of scale and produces power at relatively low cost. There are other technologies that produce power, most notably fuel cells, microturbines, windmills and solar cells. It is possible that advances in technology will reduce the cost of alternative methods of producing power to a level that is competitive with that of most central power station electric production. If this were to happen and if these technologies achieved economies of scale, Southern Company's market share could be eroded, and the value of its electric generating facilities could be reduced. Changes in technology could also alter the channels through which retail electric customers buy power, which could reduce Southern Company's revenues or increase expenses.

II. SOUTHERN CO. AND ITS POWER PLANT EMISSIONS

Southern Company is the nation's second largest electric utility and the nation's second largest consumer of coal (behind American Electric Power). According to an independent benchmarking study conducted by the Natural Resources Defense Council, Southern was the second largest U.S. utility emitter of carbon dioxide, sulfur dioxide, nitrogen oxides and mercury in 2000. That year, Southern had 32,000 megawatts of capacity and coal provided 76 percent of its power generation. With 128 million metric tons of carbon dioxide emissions, Southern accounted for 6.4 percent of U.S. utilities' CO2 emissions in 2000, according to the NRDC study. Southern has told IRRC that it is considering the adoption of CO2 emissions control targets.

To date, Southern has spent considerable sums to comply with the Federal Clean Air Act, which addresses sources of air pollution. It estimates that its construction expenditures have totaled $400 million to achieve significant reductions in sulfur dioxide and nitrogen oxide emissions under the first two phases of the Clean Air Act Acid Rain provisions. In the 1990's, Southern cut its sulfur dioxide emissions by 40 percent and its nitrogen oxides emissions by 28 percent, even as its electricity generation has increased by 20 percent.

In addition, Southern has spent $980 million to reduce nitrogen oxide emissions from power plants in nonattainment areas around Atlanta, Ga., and Birmingham, Ala., to meet a regulatory requirement that goes into effect in May 2003. Additional

construction expenditures for compliance in the Georgia nonattainment area are estimated at $305 million to achieve standards that will go into effect in May 2005. Altogether, Southern expects to spend an additional $4 billion or more by 2015 to further reduce its overall emissions-not including carbon dioxide.

Outlook to 2020: Unlike most utilities, Southern provides a long-term outlook for its power supply and projected emissions, dating to 2020. Its key projections are as follows:

- Power generation-Southern expects its annual power generation to increase from 172 million megawatt-hours in 2000 to approximately 250 MWh in 2020, an increase of 45 percent.
- Fuel mix-Southern expects its power supplied from coal to decrease from 76 percent in 2000 to 38 percent in 2020; its power from natural gas to increase from 4 percent to 53 percent; its power from nuclear energy to fall from 16 percent to 6 percent; and its power from hydro and oil to stay at about 3 percent.
- Sulfur dioxide and nitrogen oxide emissions-Southern expects its emissions of sulfur dioxide to fall from nearly 1.5 million tons in 1990 to about 300,000 tons in 2020, a decrease of about 80 percent. It expects its emissions of nitrogen oxides to fall from 400,000 tons to about 127,000 tons, a decrease of about 68 percent.
- Carbon dioxide emissions-As a result of generation growth, Southern expects its carbon dioxide emissions to increase from 128 million metric tons in 2000 to approximately 148 MMT in 2020, an increase of about 16 percent. It says, "Although our current projections indicate a rise in the years ahead, much focus is being placed on how we can continue to meet the energy needs of our customers while addressing emissions of greenhouse gases such as CO2." From 1990 to 2020, Southern projects that its CO2 emissions will increase by a total of 45 percent.

Carbon dioxide emissions reduction programs: Since 1991, Southern has avoided or offset a total of 55 million metric tons of CO2 equivalent. It has registered these savings with the Department of Energy under Section 1605(b) of the 1992 Energy Policy Act. The savings have been achieved mainly through improved performance of three nuclear power plants, thereby offsetting generation and emissions from coal-fired units. Southern has received 20-year license extensions for two of its three nuclear power plants, which will extend their expected life of operation past 2030.

Southern has also sequestered carbon through a reforestation program that has planted more than 35 million trees. Other carbon dioxide emissions savings include 3.6 MMT from demand-side management programs, 0.2 MMT from biomass co-firing in coal-fired power plants, 0.6 MMT of CO2 equivalent from methane reductions and 0.8 MMT of CO2 equivalent from reductions in sulfur hexafluoride, a potent greenhouse gas.

Congressional Legislation

Several major bills have been proposed in Congress to impose more stringent emissions limitations under the Clean Air Act. Three of these bills-the Bush Administration's Clear Skies Act, the Clean Power Act of 2002 and the Clean Air Planning Act of 2002-propose to further limit power plant emissions of sulfur dioxide, nitrogen oxides, and mercury. The latter two bills also propose to limit emissions of carbon dioxide. Though none of these bills was enacted into law in the last Congress, similar bills have been introduced in 2003.

Carbon dioxide legislation: In addition to the Clean Power Act and Clean Air Planning Act of 2002, other bills have been introduced in Congress, including the Climate Stewardship Act of 2003, which proposes capping greenhouse gas emissions by 2010 and returning them to 1990 levels by 2016. In its 2002 Form 10-K, Southern does not indicate whether these bills would have material impacts on the company's operations and financial condition. It says the cost impacts of such legislation would depend upon the specific requirements enacted.

Management does say in the Form 10-K that domestic efforts to limit greenhouse gas emissions have been spurred by international discussions surrounding the Framework Convention on Climate Change and specifically the Kyoto Protocol, which proposes international constraints on the emissions of greenhouse gases. Southern is involved in a voluntary electric utility industry initiative in partnership with the Bush Administration, which does not support ratification of the Kyoto Protocol or other mandatory carbon dioxide reduction legislation. The Bush Administration's voluntary climate initiative seeks an 18 percent reduction by 2012 in the rate of greenhouse gas emissions relative to the dollar value of the U.S. economy. Electric utilities have pledged a 3 to 5 percent reduction in the carbon intensity of their emissions by 2012. Absolute emissions of carbon dioxide would continue to rise. Because this initiative is still under development, Southern says it is not possible to determine the effect on the company at this time.

New Source Review and Related Lawsuits

If Southern fails to comply with environmental laws and regulations, even if caused by factors beyond its control, that failure may result in the assessment of civil or criminal penalties and fines against the company. The U.S. Environmental Protection Agency has filed civil actions against Alabama Power, Georgia Power and Savannah Electric alleging violations of the New Source Review provisions of the Clean Air Act. The EPA has also issued notices of violation to Gulf Power and Mississippi Power. Management says in its Form 10-K that an "adverse outcome in any one of these cases could require substantial capital expenditures that cannot be determined at this time and could require payment of substantial penalties," ranging up to $27,500 per day, per violation at each generating unit.

The New Source Review provisions of the Clean Air Act address older power plants that do not meet the more stringent emissions control requirements imposed on newest plants. The provisions were meant to require the installation of best available pollution control technology on older power plants if they were overhauled and underwent major modifications. Questions have arisen, however, over what constitutes major modification and what is considered routine maintenance for these plants.

In December 2002, the EPA issued final and proposed revisions to the New Source Review program that are intended to clarify which maintenance expenditures do not warrant obtaining new Clean Air Act permits. Several Northeastern States petitioned the District of Columbia Circuit Court in February 2003 for a stay of the final rules. The stay was not granted. The proposed rules were open to public comment and may be revised before being finalized by the EPA. Any final regulations must be adopted by the States in the company's service area in order to apply to its facilities. Management says it cannot determine the effect of these proposed and final rules concerning the New Source Review at this time.

Lawsuits: In November 1999, the EPA began a civil action against Alabama Power, Georgia Power and Savannah Electric alleging violations of the New Source Review provisions of the Clean Air Act. The lawsuit requests penalties and injunctive relief, including an order requiring the installation of the best available control technology at six affected units. The EPA has issued a notice of violation relating to each of these facilities as well as two others owned by Alabama Power.

The cases against Southern's operating units have been stayed since the spring of 2001. A ruling is pending by the U.S. Court of Appeals for the Eleventh Circuit in the appeal of a very similar New Source Review enforcement action against the Tennessee Valley Authority. Because the outcome of the TVA appeal could affect the lawsuits pending against Southern's operating units, Alabama Power and Georgia Power have become parties to the TVA case as well. Southern believes its operating units were engaged in "common and traditional maintenance activities" of its power plants and "complied with applicable laws and the EPA's regulations and interpretations in effect at the time the work in question took place."

Other Clean Air Act Issues

Southern's 2002 Form 10-K addresses a number of other requirements concerning the Clean Air Act and State clean air standards. These requirements are likely to result in additional capital expenditures, although in each instance management says it does not have enough information to characterize the possible impact on the company's operations or financial condition. These include:

National ambient air quality standards for ozone and fine particulate matter: The U.S. Environmental Protection Agency will issue final implementation rules in 2004 that are expected to designate several areas within the company's service area with nonattainment under the new ozone and fine particulate matter standards. State implementation plans to bring those areas into compliance could be required as early as 2007. Those State plans could require further reductions in nitrogen oxide and sulfur dioxide emissions from power plants sometime after 2007. Management says the impact of any new standards will depend on the development and implementation of applicable regulations.

Regional Transport Rule: The EPA also is expected to issue final rules for a Regional Transport Rule for the fine particulate matter standard in 2005. This rule would likely require year-round sulfur dioxide and nitrogen oxide emission reductions from power plants as early as 2010. If issued, this rule would likely modify other State implementation plan requirements for attainment of the fine particulate matter standard and ozone standard referenced above. Management says it is not possible at this time to determine the effect such a rule would have on the company.

Regional haze: Further reductions in sulfur dioxide also could be required under the EPA's Regional Haze rules. The Regional Haze rules require States to establish Best Available Retrofit Technology (BART) standards for certain sources that con-

tribute to regional haze. Southern says it has a number of plants that could be subject to these rules. State Implementation Plans for these rules are due in 2007 and 2008. Because new BART rules have not been developed and State visibility assessments are only beginning, management says it is not possible to determine the effect of these rules on the company at this time.

Compliance assurance monitoring: The EPA's Compliance Assurance Monitoring (CAM) regulations require that monitoring be performed to ensure compliance with emissions limitations on an ongoing basis. Four of Southern's operating companies will be applying for renewal of operating permits between 2003 and 2005 that will likely be subject to CAM requirements for at least one pollutant (in most cases particulate matter). The company is in the process of developing CAM plans, which could indicate a need for improved particulate matter controls at affected facilities. Because the plans are still in the early stages of development, management says it cannot determine the extent to which improved controls could be required or the costs associated with any necessary improvements.

Mercury: The EPA plans to issue final rules regulating mercury emissions from electric utility boilers by the end of 2004. The program is being developed under the Maximum Achievable Control Technology provisions of the Clean Air Act. Compliance could be required as early as the end of 2007. Because the rules have not yet been proposed, management says the costs associated with compliance cannot be determined at this time.

Coal Research

Southern is committed to the continued use of coal as one of its main sources of generation. It says on its company website that is pursuing development of coal technologies that "could 1 day generate energy from coal while producing dramatically fewer emissions or no emissions at all." Southern has managed more than $400 million in research and development efforts over the last 10 years, much of it on clean-coal technologies. "During the transition period to new clean coal technologies and other cleaner generation, it is critical that existing units be kept in efficient, operational order to maintain the reliability of our electric power system," the company says. "Utilities must be able to operate and maintain their plants to meet increases in demand for electricity."

At a facility in Alabama, Southern has successfully tested a technology that turns coal into gas, which could be used to produce electricity more cleanly than traditional coal plants. Coal gasification would cut carbon dioxide emissions by more than one third, relative to conventional coal plants, and emissions of sulfur dioxide, nitrogen oxides and particulate matter also would be "significantly reduced," according to the company. The research program is a partnership with the U.S. Department of Energy in which $271 million has been invested.

Southern is also one of eight large coal-burning utilities and coal companies to form an alliance that seeks the creation of a "near zero-emission" coal-fueled power plant. The alliance is in support of President Bush's FutureGen Initiative, a 10-year public-private partnership that seeks to advance the use of hydrogen through extraction from coal. An April 22, 2003, press release announcing the alliance States that "The U.S. has more than a 300-year supply of coal; therefore, the effort to design near zero-emissions power plants promises to create a new way in which coal can power our economy with minimal environmental impacts."

Southern also became the first utility to join the Zero Emission Coal Alliance. The aim of the alliance is to test technology that generates electricity with coal in a process that stores carbon dioxide in a solid, mineral carbonate form, thereby eliminating greenhouse gas emissions. Hydrogen extracted from coal through an anaerobic process is used in a fuel cell to generate electricity. Rights to the proprietary technology are now held by ZECA Corporation, which aims to be "the premier owner and supplier of Zero Emission Coal and Carbon solutions."

III. PROPONENTS' POSITION

This is the fourth time that shareholder proponents affiliated with the Interfaith Center on Corporate Responsibility have submitted a global warming resolution to Southern Company. Shareholder proponents withdrew resolutions asking the company to report on the costs and liabilities of climate change in 1997, 1999 and 2002. The withdrawals came because "the company was willing to be forthcoming with data we were asking for," according to Sister Patricia Daly, executive director of the Tri-State Coalition for Responsible Investment, who has been one of the lead filers at Southern.

Earlier this year, the company once again sent representatives, including Dr. Charles Goodman, Southern's senior vice president for research and environmental affairs, to meet with Daly and other shareholder proponents in New York. Daly told

IRRC that this year's meeting was not as productive as in years past, "because they clearly had not done their homework on what our new resolution is about." Company executives presented an update of Southern's environmental progress and initiatives. "But we're in a whole new ballgame now," Daly explained. "We want the company to evaluate its data in terms of climate change risk, and we don't have any indication that anyone at the company is doing this."

The resolved clause of the 2003 global warming resolution has two elements. It asks the company's board of directors to report on:

(a) the economic risks associated with the Company's past, present and future emissions of carbon dioxide, sulfur dioxide, nitrogen oxide and mercury emissions, and the public stance of the company regarding efforts to reduce these emissions and (b) the economic benefits of committing to a substantial reduction of those emissions related to its current business activities (i.e., potential improvement in competitiveness and profitability).

In a presentation by Ceres, a coalition working closely with the Interfaith Center on the 2003 shareholder campaign, general arguments made in favor of the global warming resolution filed with electric utilities are as follows:

1. Health and environmental risks from pollutants: Electric utilities account for two-thirds of the nation's sulfur dioxide emissions, one-third of its mercury emissions and nearly one-quarter of its nitrogen oxides emissions. These pollutants contribute to asthma, lung and heart disease and mercury bioaccumulation in humans, and cause extensive damage to the environment, including acid rain, smog and mercury bioaccumulation in fish and other species. At the same time, electric utilities account for 37 percent of the nation's carbon dioxide emissions, the main gas tied to global warming.

2. Government regulation of these pollutants: Emissions of sulfur dioxide and nitrogen oxides are regulated under the Clean Air Act. This Federal law will require substantial additional reductions of these emissions as well as mercury in the years ahead. Utilities will have to make major new investments in pollution control technology, but this technology will not control carbon dioxide emissions.

3. Risks of not factoring in carbon dioxide controls: The proponents believe domestic regulatory controls of CO2 are inevitable. Two States (New Hampshire and Massachusetts) have already passed laws restricting utility emissions of CO2, and Federal legislation has been introduced as well. At the international level, the Kyoto Protocol is likely to go into effect this year (although the Bush Administration has said the United States will not be bound by the agreement).

According to studies cited by the proponents, the most expensive choice utilities could make is to retrofit existing fossil energy plants with new pollution control equipment and then have to reduce CO2 emissions from these plants. The proponents argue that utilities should factor future CO2 controls into their investment strategies now, since it could alter decisions about which power plants to retrofit with new pollution control equipment and which to replace with new, cleaner energy sources.

4. Need for greater disclosure by utilities: By some estimates cited by the proponents, many electric utilities face a "carbon exposure" of between 10 and 35 percent of their total market capitalization. (In other words, the cost of achieving carbon dioxide emission controls as specified by the Kyoto Protocol equals 10 to 35 percent of the current value of their stock.) Many factors go into making this calculation, including a utility's generating assets, fuel mix, installed pollution control technologies and whether it is competing in a deregulated electricity market. "Investors cannot assess this risk without more disclosure" from utilities, according to Ceres.

That is why the proposal calls on management to conduct a thorough economic assessment of the risks and benefits of achieving substantial emissions reductions of the four pollutants listed in the proposal. "We believe that taking early action on reducing emissions and preparing for standards could better position companies over their peers, including being first to market with new high-efficiency and low-emission technologies," the proponents argue. "Changing consumer preferences, particularly those relating to clean energy, should also be considered. Inaction and opposition to emissions control efforts could expose companies to reputation and brand damage, and regulatory and litigation risk," it concludes.

IV. MANAGEMENT'S POSITION

Management opposes the resolution seeking more disclosure on the company's efforts to address climate change. It argues that the resolution would duplicate company reporting activities and be unduly speculative. It says in its proxy statement that "the detailed information requested on future costs and risks would require

knowledge of future governmental or other legal action," beyond what is already discussed in company reports.

Management says the proponents' request for information on the "economic risks associated with the Company's past, present, and future emissions" can be found in the Southern's Annual Report on Form 10-K, which is available on the Company's website and the website of the Securities and Exchange Commission. In addition, details on the company's risk factors, including historic and anticipated environmental costs and known future contingencies, are included in the company's Annual Report to Stockholders in the Management's Discussion and Analysis section.

Finally, management says the company's environmental commitment and achievements are described in its Environmental Progress Report, which is available for viewing and downloading on the company's website and will be sent to stockholders or others upon request.

Management does not offer any specific comments in its proxy statement on the global warming issue or its expenditures to control emissions of pollutants regulated by the Clean Air Act. It says only that Southern "is committed to complying fully with all environmental laws and regulations as well as maintaining our commitment to environmental stewardship in such a way that appropriately considers our customers and stockholders."

V. IRRC ANALYSIS

SmartVoter Guidelines

Voting guidelines for this resolution are presented under issue number 3425 in IRRC's SmartVoter product.

Questions Raised

- Is Southern responding adequately to the risks of global warming?
- Could Southern do more to report on these risks to shareholders?

Risks of global warming: As the nation's second largest electric utility, and one of the most heavily reliant on coal, Southern has a tremendous amount at stake in the global warming debate. Carbon dioxide emissions from its power plants account for nearly 2.5 percent of the nation's CO2 emissions. As it expands its power generation, Southern expects these emissions to grow by another 16 percent by 2020-for a total increase of 45 percent between 1990 and 2020.

Legislation proposed in Congress calls on companies to "cap and trade" their emissions. Under the Climate Stewardship Act, for example, companies would be required to return to 1990 emissions levels by 2016. The Kyoto Protocol (which the United States has not endorsed) calls for more stringent controls-a 7 percent cut in CO2 emissions below 1990 levels by 2012. Management says it is focused on "addressing emissions of greenhouse gases such as CO2," but it has not indicated to shareholders the extent of such controls and whether they would have a material impact on the company's operations and financial condition. It says the cost impacts of CO2 controls would depend upon specific requirements of government legislation.

Meanwhile, Southern continues to make extensive investments in its aging fleet of coal-fired power plants. As the utility industry's #2 emitter of sulfur dioxide and nitrogen oxides, Southern has spent $1.4 billion to install pollution control equipment under the acid rain and ozone nonattainment provisions of the Clean Air Act. It expects to spend an additional $4 billion or more by 2015 to further reduce these and mercury emissions. However, its spending on pollution control could be higher and come sooner if it loses a series of court cases now before U.S. Court of Appeals. At issue is whether Southern's older coal plants must install best available pollution control technology when they receive modifications. Management says that an adverse outcome in any one of these cases could require "substantial capital expenditures" and could require payment of "substantial penalties"-ranging up to $27,500 per day, per violation at each generating unit.

The proponents are concerned that Southern may find itself making costly investments to retrofit existing fossil energy plants with new pollution control equipment and later have to reduce CO2 emissions from these plants, compromising the future value of these investments. The proponents argue that utilities should factor possible CO2 controls into their investment strategies now, since that could alter their decisions about which power plants to retrofit and which to replace with new, cleaner energy sources. Accordingly, they are asking management to issue a report on this issue.

Adequacy of reporting by Southern: Southern provides a much clearer outlook for its power generation than most electric utilities. With projections out to 2020, management has informed shareholders that it expects its power generation to grow by 45 percent, even as it reduces its emissions of sulfur dioxide and nitrogen oxides by 68 to 80 percent of 1990 levels. These reductions will be made possible not only

by investments in pollution control equipment at its coal-fired plants, but also by construction of new gas-fired plants to meet incremental power demand. Natural gas is expected to account for about half of Southern generating mix by 2020, while coal's contribution is expected to fall from about two-thirds to just over one-third. Because natural gas has a lower carbon content than coal and burns more efficiently, Southern also expects to reduce the "carbon emissions intensity" of its power production. For every 3 percent increase in power generation, it is projecting only a 1 percent increase in its CO2 emissions.

As detailed as this reporting is, it still does not answer the proponents' fundamental question, however: What will the company do if it has to achieve stabilization or reductions in its CO2 emissions over the next 10 to 20 years? By 2020, Southern's CO2 emissions are projected to be 45 percent above 1990 levels. Accordingly, even achieving stabilization at 1990 levels would entail a substantial emissions reduction from the levels now being projected.

On this vital contingency, management offers very little guidance in its Form 10-K or other securities filings. With respect to government policy, management says the effects on the company would depend on the terms of legislative controls. With respect to technology, management does acknowledge that the commercial success of low-emitting technologies, such as fuel cells and renewables, could erode its market share and reduce the value of its electric generating facilities, if they achieve economies of scale. But again management gives no indication of whether these developments would be material to the company and its shareholders. By inference, the suggestion is that they could be.

By reviewing the company's environmental report, shareholders are able to glean some other useful pieces of information. With respect to renewables, Southern does not see them posing much of a threat-or opportunity-in its service area because the available resources are limited and the costs of generation are higher than power from coal or natural gas. (This assumes no costs of carbon emissions will be added to these fuels.) With respect to coal, Southern says it is pursuing development of cleaner-burning technologies that "could 1 day generate energy from coal while producing dramatically fewer emissions or no emissions at all." It does not give a clear sense of the generating costs or technological hurdles that remain with clean coal technologies, however, so it is not possible for shareholders to compare their prospects with those of renewables. Finally, with respect to the issue of climate change, Southern continues to regard it as "global and long-term in nature," and believes that policies "should seek to resolve climate change scientific uncertainties." Management's key point is this:

During the transition period to new clean coal technologies and other cleaner generation, it is critical that existing units be kept in efficient, operational order to maintain the reliability of our electric power system. Utilities must be able to operate and maintain their plants to meet increases in demand for electricity.

Herein lies the dilemma for investors. The proponents say management must provide better information on the costs and risks of this strategy, given that the cost of achieving carbon dioxide emission controls ranges from 10 to 35 percent of the current value of utility companies' stock, according to some estimates. Management says, however, that the detailed information requested by the proponents would require knowledge of future governmental or other legal action beyond what is already discussed in company reports.

In the final analysis, shareholders who are satisfied with Southern's current level of reporting-which at least provides a clear outlook for the company's generating mix and projected emissions through 2020-will be inclined to side with management and vote against this proposal. Those who feel that management could set some better financial parameters around the uncertainties in its outlook-especially what legal, regulatory and legislative developments could be material to the company and its shareholders-will be inclined to support the proponents' call for a more detailed report on the costs and benefits of Southern's evolving response to climate change.

EXCERPT FROM SOUTHERN CO.'S PROXY STATEMENT

Shareholder Proposal Related To An Environmental Report:

"ELECTRIC UTILITY RESOLUTION

WHEREAS:

In 2001 The Intergovernmental Panel on Climate Change concluded that "there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities."

In 2001 the National Academy of Sciences stated that the "degree of confidence in the IPCC assessment is higher today than it was 10, or even 5 years ago . . . there is general agreement that the observed warming is real and particularly strong within the past 20 years."

The United States government's "Climate Action Report—2002," concluded that global climate change may harm the country. The report highlights risks to coastal communities in the Southeast due to sea level rise, water shortages throughout the West, and increases in the heat index and frequency of heat waves.

In July 2002, 11 Attorneys General wrote President Bush, outlining their concern over the U.S. Climate Action Report's failure to recommend mandatory reductions of greenhouse gas emissions. They declared that States are being forced to fill the Federal regulatory void through State-by-State regulation and litigation, increasing the ultimate costs of addressing climate change. They urged a reconsideration of his regulatory position, and adoption of a "comprehensive policy that will protect both our citizens and our economy."

U.S. power plants are responsible for about two-thirds of the country's sulfur dioxide emissions, one-quarter of its nitrogen oxides emissions, one-third of its mercury emissions, approximately 40 percent of its carbon dioxide emissions, and 10 percent of global carbon dioxide emissions.

Scientific studies show that air pollution from U.S. power plants causes tens of thousands of premature deaths and hospitalizations, hundreds of thousands of asthma attacks, and several million lost workdays nationwide every year from pollution-related ailments.

Standards for carbon dioxide emissions and other air pollutants are emerging across multiple fronts. Ninety-six countries have ratified the Kyoto Protocol, requiring carbon dioxide reductions. Massachusetts and New Hampshire have enacted legislation capping power plants emissions of carbon dioxide and other air pollutants. In June 2002 the Senate Environment and Public Works Committee passed a bill seeking to cap emissions from the generation of electric and thermal energy.

We believe that taking early action on reducing emissions and preparing for standards could better position companies over their peers, including being first to market with new high-efficiency and low-emission technologies. Changing consumer preferences, particularly those relating to clean energy, should also be considered.

Inaction and opposition to emissions control efforts could expose companies to reputation and brand damage, and regulatory and litigation risk.

RESOLVED: That the Board of Directors report (at reasonable cost and omitting proprietary information) by August 2003 to shareholders on (a) the economic risks associated with the Company's past, present and future emissions of carbon dioxide, sulfur dioxide, nitrogen oxide and mercury emissions, and the public stance of the company regarding efforts to reduce these emissions and (b) the economic benefits of committing to a substantial reduction of those emissions related to its current business activities (i.e. potential improvement in competitiveness and profitability)."

THE BOARD OF DIRECTORS RECOMMENDS A VOTE "AGAINST" ITEM NO. 3 FOR THE FOLLOWING REASONS:

The Company is committed to complying fully with all environmental laws and regulations as well as maintaining our commitment to environmental stewardship in such a way that appropriately considers our customers and stockholders.

The proposal requests a report to our shareholders on the "economic risks associated with the Company's past, present, and future emissions." The Company currently provides details regarding its risk factors including historic and anticipated environmental costs and known future contingencies. This information is included in the Company's Annual Report on Form 10-K for the year ended December 31, 2002 ("Form 10-K"). The Form 10-K is available on the Company's website and the website of the Securities and Exchange Commission and may be obtained from the Company. (See page 2 of this Proxy Statement for information on requesting a copy of the Form 10-K from the Company.)

Details on the Company's risk factors, including historic and anticipated environmental costs and known future contingencies, are also included in the Annual Report to stockholders in the Management's Discussion and Analysis of Results of Operations and Financial Condition section and in the Notes to Financial Statements.

In addition, the Company's environmental commitment and achievements are described in our Environmental Progress Report. This report is available for viewing and downloading on the Company's website and will be sent to stockholders or others upon request.

The Company opposes this proposal because the information the Company would report is largely duplicative of information already provided. We also believe the de-

tailed information requested on future costs and risks would require knowledge of future governmental or other legal action and is too speculative to report and quantify as requested by the proposal, beyond what is discussed in the reports noted above. We believe that it is in the best interests of our stockholders that the Company not be required to incur the additional expense of producing and distributing such a report.

The vote needed to pass the proposed stockholders' resolution is a majority of the shares represented at the meeting and entitled to vote.

THE BOARD OF DIRECTORS RECOMMENDS A VOTE "AGAINST" ITEM NO. 3.

STATEMENT OF MARK BROWNSTEIN, DIRECTOR OF ENTERPRISE STRATEGY, PSEG SERVICES CORPORATION

I am honored to be here this morning to represent Public Service Enterprise Group (PSEG), and the Clean Energy Group.

PSEG is a diversified energy company with over $25 billion in assets and over $8 billion in annual revenues. The PSEG family of companies includes Public Service Electric and Gas Company, New Jersey's oldest and largest electric and gas delivery company, PSEG Global, which owns and operates energy production and distribution facilities overseas, and PSEG Power, one of the largest independent electric generating companies in the United States, with 13,000 megawatts of electric generating capacity operating or under construction in New Jersey, New York, Connecticut, Pennsylvania, Ohio, and Indiana.

The Clean Energy Group (CEG) is a coalition of companies with more than 100,000 Mw of generation capacity nationwide, including coal, gas, oil, nuclear, and renewables. The members of CEG—Consolidated Edison, Inc., Entergy, Exelon Corporation, KeySpan, Northeast Utilities, PG&E National Energy Group, Sempra Energy, and PSEG are committed to promoting progressive environmental policies that are economically sound and sustainable.

PSEG, which celebrates its 100th anniversary this week, has long believed that environmental performance is one indicator of overall business performance. Experience has taught us that proactive steps to improve environmental performance can often lead to better bottom line results. That said we never take our eye off of bottom line results. In our view, environment and economics are inseparable, and, as with many things in life, the secret to success is finding the right balance.

If you remember only one thing from what I say here today, please remember that one word: balance. For PSEG and the CEG member companies, the single greatest value to be derived from Federal multi-pollutant legislation aside from the public health and environmental benefits themselves—is certainty. And the best way we know to achieve certainty is through a public policy outcome that strikes the right balance between environmental and energy policy objectives.

I am aware that this is the third hearing you have held on the many questions surrounding multi-pollutant legislation. And I am also aware that various stakeholders have come before you to argue that the current proposals on the table go too far, or do not go far enough. I suppose such a tug of war is common in politics, but in business, we often worry when any one extreme carrys the day, for experience shows that a strong pull to any one extreme only invites an equal and opposite backlash at some point down the road. From day one, our goal in this debate has been to seek and encourage consensus for we believe that it is only through consensus that we can achieve the kind of regulatory stability essential to the health of our industry.

You have heard from others here today about the importance of certainty, and I echo that concern. This is a very capital intensive industry, where large investments are made in assets that last 30 years or more. Making large bets on the future is an inherently risky proposition, and no amount of legislative activity on your part can offer us 100 percent certainty. But to the extent that the trajectory of future environmental requirements looms large in the planning of any major player in our industry, you can make a significant difference by crafting legislation that clearly articulates expectations over the next 15 years, at least.

The past two and a half years have been tumultuous for our industry. We do not need any more excitement. But where some people might argue that now is the wrong time to set new environmental requirements, we would argue that to take this "do nothing" advice would be to kill us with kindness.

Whether you believe that the current oversupply of generation and capital crunch will last 2 years or 5 years, the fact of the matter is that current market conditions in our industry are part of a cycle. At some point, hopefully soon, companies like

ours will begin to make new investments in our nation's energy infrastructure, and when we do, it is critical that we have a clear understanding of the environmental requirements we will have to meet. Otherwise, I fear, we will be making bad investments.

Nowhere is this more true than the issue of carbon dioxide regulation. First off, let me state for the record, as we have said many times in the past, PSEG believes that President Bush was right to reject the Kyoto Protocol. The reductions contemplated under that agreement demanded too much, too fast for our industry and our economy to handle.

At the same time, we think the issue of climate change is real, and we believe a domestic regulatory response is both necessary and inevitable. Given that our industry is singularly responsible for over a third of the nation's greenhouse gas emissions and 10 percent of total manmade greenhouse gas emissions worldwide, we cannot, and should not dodge this issue.

With this perspective in mind, we believe that we are better off as a company, and as an industry, if we develop and implement a moderate response now rather than wait 10 years, only to find that the political problem is now worse or that the environmental problem requires a more drastic response, and the investment decisions made in the interim were dead wrong. This is one of the reasons why we think the bill introduced by Senators Carper, Chafee, Gregg make such an important contribution to this debate, and why we have been such strong supporters of their efforts.

We are encouraged by the leadership that the Bush Administration has shown on the issue of multi-pollutant legislation, and we deeply appreciate the leadership that Senator Inhofe and, you, Senator Voinovich, have shown in tackling this very difficult issue. We encourage you in your efforts to find that balance that I talked about earlier, and I pledge the full support of PSEG and the CEG companies in your efforts.

Once again, thank you for the opportunity to testify before this committee. I will be happy to answer any questions you may have.